SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 24
DECEMBER 15, 1974

W74-12751 -- W74-13500

OFFICE OF WATER RESEARCH AND TECHNOLOGY

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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

DEPOLARIZED RAYLEIGH SCATTERING AND HYDROGEN BONDING IN LIQUID WATER,
Catholic Univ. of America, Washington, D.C.
C. J. Montrose, J. A. Bucaro, J. Marshall-Coakley, and T. A. Litovitz.
The Journal of Chemical Physics, Vol 60, No 12, p 5025-5029, June 15, 1974. 5 fig, 20 ref.

Descriptors: *Hydrogen bonding, *Water structure, Water properties, Kinetics, Liquids, Molecular structure, Temperature, Spectroscopy.
Identifiers: *Rayleigh scattering.

Depolarized Rayleigh scattering spectra were obtained for water over essentially its entire liquid range at atmospheric pressure. Three principal components of the Rayleigh line were identified and are described in terms of reorientation of the molecules, the formation and breaking of hydrogen bonds between molecules, and polarizability anisotropies resulting from the collisions or interactions among several molecules. For the region of the spectrum 0 to 50 cm(-1), the most intensive component of the spectrum has been ascribed to hydrogen bond kinetics; from it the mean lifetime of a hydrogen bond in water was determined as a function of temperature. (Witt-IPC)
W74-12922

STUDY OF THE STRUCTURE OF MOLECULAR COMPLEXES. VI. DIMERS AND SMALL CLUSTERS OF WATER MOLECULES IN THE HARTREE-FOCK APPROXIMATION,
IBM Research Lab., San Jose, Calif.
H. Kistenmacher, G. C. Lie, H. Popkie, and E. Clementi.
The Journal of Chemical Physics, Vol 61, No 2, p 546-561, July 15, 1974. 14 fig, 6 tab, 32 ref.

Descriptors: *Water structure, *Molecular structure, Energy, Theoretical analysis, Stability, Model studies, *Water properties.
Identifiers: Hartree-Fock approximation.

The analytical fit to a large number of Hartree-Fock computations for the water-water interaction was reanalyzed and used to study small clusters of water molecules. With the analytically fitted Hartree-Fock potential, thousands of possible configurations for the dimers, trimers, tetramers, pentamers, hexamers, heptamers, and octamers of water were compared in order to determine the configuration of lowest energy (maximal stabilization energy). For the dimer two possible stable configurations are found, corresponding to an open form and a cyclic form, with the open form being more stable. For the trimers and tetramers the cyclic forms are somewhat more stable than the open structures. For the larger clusters it is concluded that it is rather meaningless to consider a single structure, but what is physically relevant is the statistical distribution of different configurations, since many configurations with significantly different geometry have nearly the same energy. The comparison of the stabilization energy per molecule of the different clusters with the corresponding value for liquid water does not support the mixture-model theories of the structure of liquid water. (Witt-IPC)
W74-12923

STRUCTURE OF LIQUID WATER. STATISTICAL THERMODYNAMIC THEORY,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
A. T. Hagler, H. A. Scheraga, and G. Nemethy.
Journal of Physical Chemistry, Vol 76, No 22, p 3229-3243, Oct. 26, 1972. 9 fig, 6 tab, 45 ref.

Descriptors: *Water structure, *Molecular structure, *Thermodynamics, Theoretical analysis, Hydrogen bonding, Mathematical models, Model studies, Water, Statistical methods.

A statistical thermodynamic treatment is presented for a model of liquid water which consists of a continuous distribution of cluster sizes in equilibrium. A partition function is written for this model, and the distribution of cluster sizes, the median cluster size, and the mole fraction of unbroken hydrogen bonds are calculated. The median cluster size is 11.2 at 0C, and at no temperature is there a significant number of large clusters (more than 60). The approximations made in the theory are analyzed in terms of their effects on the results and in relation to similar approximations made in other theories. The inapplicability of a two-state model to liquid water is also discussed terms of the results obtained. (See also W74-13418) (Witt-IPC)
W74-13417

STRUCTURE OF LIQUID WATER. II. IMPROVED STATISTICAL THERMODYNAMIC TREATMENT AND IMPLICATIONS OF A CLUSTER MODEL,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
B. R. Lentz, A. T. Hagler, and H. A. Scheraga.
Journal of Physical Chemistry, Vol 78, No 15, p 1531-1550, July 18, 1974. 11 fig, 9 tab, 64 ref.

Descriptors: *Molecular structure, *Water structure, *Thermodynamics, Model studies, Theoretical analysis, Water properties, Water, Mathematical models, Hydrogen bonding, Statistical methods.

An earlier statistical thermodynamic treatment of a cluster model of liquid water is extended, and many of its approximations are improved. The results of recent LCAO-MO calculations are used to estimate the effects of cooperativity on the internal partition function of a cluster; these effects unexpectedly make large-size clusters unfavorable. Hydrogen-bonded ring structures are also included in the model. The intermolecular normal mode frequency spectrum of a cluster is calculated explicitly by making use of a recently proposed 'effective pair potential' for water molecule interactions. These and other improvements over the earlier treatment are incorporated into a partition function, and the thermodynamic properties of liquid water are calculated over the range of 0 to 100C, using only two adjestable parameters. The distribution of cluster species resulting from these calculations contains only small clusters (size less than 10), and the mole fraction of H bonds decreases from 0.47 at 0C to 0.43 at 100C. The intermolecular vibrational spectrum of liquid water (and its temperature dependence) is calculated from the distribution of cluster species and their normal mode frequencies. The approximations made in the theory are analyzed in terms of their effect on the results and of their implications for the structure of liquid water. The results of the calculations have much in common with the continum point of view. They also provide a tentative explanation for the apparent 'two-state' properties of water. (See also W74-13417) (Witt-IPC)
W74-13418

RAMAN SPECTRA AND STRUCTURE OF WATER FROM -10 TO 90 (DEGREES C),
Regional Research Lab. Agricultural Research Service, Berkeley, Calif.
J. R. Scherer, M. K. Go, and S. Kint.
Journal of Physical Chemistry, Vol 79, No 13, p 1304-1313, June 20, 1974. 11 fig, 4 tab, 33 ref.

Descriptors: *Heavy water, *Water structure, Water, Molecular structure, Spectroscopy, Hydrogen bonding, Deuterium, Water properties, Thermodynamics, Polarity.
Identifiers: *Raman spectra.

Raman spectra were obtained for liquid water (H2O) and heavy water (D2O) from -10 to 90C and HOD from 10 to 90C. Quantitative intensities were measured for water and heavy water, and the intensity sum rule was found to hold within 10%. The difference between the dopolarization ratios of the OH and OD streches of HOD is explained on the basis of approximate normal coordinates and bond polarizability theory. The occurrence of apparent isosbestic points is observed Raman data that has not been decomposed into its isotropic and anisotropic parts is shown to be fortuitous. The isotropic and anisotropic spectra of the OH and OD stretching regions of water and heavy water are interpreted in terms of four bands. These bands are attributed to the symmetric and antisymmetric OH and OD stretching vibrations of a symmetrically H-bonded comples and the stretching vibrations of an asymmetrically H-bonded complex. Fermi resonance is shown to be responsible for the dip in the spectrum at the position of the first overtone of the HOH and the DOD bending vibrations. The band-fitting procedure is constrained by assumptions involving half-widths, band centers, and intensity arguments. The resulting analysis associates the intensity increase with decreasing temperature at 3430/cm, (2530/cm for heavy water), in the anisotropic spectrum with the antisymmetric OH stretching vibrations of the symmetric H-bonded comples. (Witt-IPC)
W74-13419

2. WATER CYCLE

2A. General

FILTER PROCESSES IN RIVER BEDS,
Karlsruhe Univ. (West Germany).
S. G. Van Riesen.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ., Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 482-494, 1972. 6 fig, 13 ref.

Descriptors: *Clogging, *Alluvial channels, *Induced infiltration, Surface-groundwater relationships, Sediments, Water pollution effects, Sedimentation, Artificial recharge.

When clean or polluted water infiltrates into a porous medium such as a river bed, clogging can result. The causes for clogging processes in beds of standing or flowing water and the mechanisms eliminating clogging in a filter matrix are discussed. The experimental procedures and results of tests using two hydraulic models are described. (See also W74-12811) (Knapp-USGS)
W74-12840

SPATIAL PATTERNS OF LONG-PERIOD STREAMFLOW FLUCTUATIONS IN THE EUROPEAN USSR,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
N. P. Smirnov.
Soviet Hydrology, Selected Papers No 2, p 112-122, 1973. 6 fig, 7 tab, 9 ref. Translated from Water Resources (Vodnyye resursy), No 2, p 21-32, 1973.

Descriptors: *Spatial distribution, *Correlation analysis, *Streamflow, *Hydrology, Distribution patterns, Statistical methods, Average flow, Time series analysis, Fluctuations, Regional analysis, Networks, Hydrologic data, Gaging stations.
Identifiers: *USSR, Regionalization, Long-period streamflow fluctuations.

Data on average annual discharges at 19 gaging stations from 1915 to 1964 were used to study long-period streamflow fluctuations in the European USSR. The drainage area size ranges from 45,900

to 1,211,003 sq km and averages annual discharges from 110 to 7,760 cu m/sec. The method of expansion in natural orthogonal functions was used to investigate the runoff variations and the generalized parameters permitted the entire European USSR to be divided into six regions. (Humphreys-ISWS)
W74-12981

MODELLING OF SURFACE RUNOFF SYSTEMS BY AN ARMA MODEL,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
S. K. Spolia, and S. Chander.
Journal of Hydrology, Vol 22, No 3-4, p 317-332, 1974. 6 fig, 1 tab, 15 ref.

Descriptors: *Surface runoff, *Mathematical models, *Model studies, *Rainfall-runoff relationships, Streamflow, Rainfall, Runoff, Storms, Parameters, Systems analysis, Hydrology, Watersheds(Basins).
Identifiers: *Nash's model, *Autoregressive models, Autoregressive cum moving average(ARMA), Deterministic models, Stochastic models.

An autoregressive cum moving average (ARMA) formulation for modelling of surface runoff systems was proposed. It emerged from this study that Nash's model is a special case of this formulation. The structural relationships between the parameters of the general ARMA and the conceptual formulations were established. A particular case of the general ARMA formulation was proposed for the modelling of a system's surface runoff behavior. The formulation corresponds to a conceptual model of two linear reservoirs in series. This model was investigated for its stability, nature of response function, and range of parameter values. (Jess-ISWS)
W74-12993

STATE VARIABLE MODEL OF OVERLAND FLOW,
Alberta Dept. of Environment, Edmonton. Div. of Technical Services.
I. Muzik.
Journal of Hydrology, Vol 22, No 3-4, p 347-364, 1974. 10 fig, 1 tab, 12 ref.

Descriptors: *Systems analysis, *Mathematical models, *Overland flow, *Model studies, Hydraulics, Hydrographs, Rainfall, Laboratory tests, Mannings equation, Hydrologic systems, Equations, Continuity equation, Momentum equation, Recession curves, Hydrologic cycle, Watersheds(Basins).
Identifiers: Laboratory catchment, State variable model.

The state variable approach to systems analysis and synthesis was used to develop a lumped mathematical model of overland flow. The model describes the unsteady non-uniform flow in terms of a set of first order ordinary differential equations and a set of arithmetic equations. Conceptually the model consists of a series of interacting reaches with unsteady uniform flow subjected to impulse inputs. Changes in hydraulic roughness due to the rainfall impact effects are accounted for. The regeneration performance of the model was tested by comparison with experimental hydrographs of overland flow from a laboratory catchment. Close agreement between experimental and calculated hydrographs was obtained for both uniformly distributed as well as temporally and spatially varied rainfall inputs. The state variable approach is not limited to overland flow; it provides a comprehensive mathematical framework for a general hydrologic model. (Jess-ISWS)
W74-13008

DETERMINISM AND STOCHASTICITY IN HYDROLOGY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
Journal of Hydrology, Vol 22, No 3-4, p 225-238, 1974. NSF Grant GK-31512X.

Descriptors: *Research and development, *Stochastic processes, *Hydrology, *History, Water resources, Theoretical analysis.
Identifiers: *Research design, Research planning, Research philosophy.

Historic controversies between deterministic and stochastic approaches in the research of natural phenomena were reviewed and constrasted to similar controversies in the field of hydrology. Two hydrologic eras associated with determinism were described and illustrated with examples. Each was evaluated for its contribution to hydrologic understanding. Limitations of the contemporary deterministic response hydrology in the analysis of classical hydrologic processes were emphasized. In terms of stochasticity, properties of hydrologic processes were described as either periodic-stochastic or purely stochastic. Both were explained and illustrated. Deterministic and stochastic approaches must be optimally integrated for the utmost mathematical-physical understanding and description of hydrologic processes and environments. (Jess-ISWS)
W74-13010

QUASI-BIENNIAL STREAMFLOW VARIATION IN THE USSR,
O. F. Kondratsova, and N. P. Smirnov.
Soviet Hydrology, Selected Papers No 2, p 182-192, 1973. 7 fig, 3 tab, 28 ref. Translated from News of the All-Union Geographic Society (Izvestiya VGO), No 2, p 149-160, 1973.

Descriptors: *Streamflow, *Hydrology, *Regional analysis, Frequency analysis, Natural flow, Runoff, Average flow, Time series analysis, Discharge(Water), Meteorology, Hydrologic aspects, Hydrologic data, Frequency, Statistical methods.
Identifiers: *USSR, Quasi-biennial streamflow variation.

Data on mean monthly discharges at 35 gaging stations on 16 rivers in the European USSR, 6 rivers in Central Asia, and 13 rivers in Siberia were analyzed. The length of observation record was 32 years, except for three Siberian rivers, where the record was 5-7 years shorter, and gaging stations in the Volga basin for which the series analyzed dated back to 1908. Atmospheric circulation was also analyzed. Streamflow fluctuations in the USSR during the period from 1931 to 1962 revealed a variation with a period of about 25-30 months everywhere, except in some rivers of East Siberia. The contribution of this variation to general runoff fluctuations over the period in question averages from 1/5 to 1/4 of its value. The role of the 2-year cycle in general streamflow fluctuations increased in some periods and was insignificant in others. The general patterns of the quasi-biennial streamflow cycle in the USSR were determined by the characteristics of variation of the pressure field that depend on the stratospheric cycle. Periods of easterly flow in the equatorial stratosphere corresponded to an increase in runoff over most of the European USSR and in the northern regions of East Siberia, and to a decrease in runoff in the extreme southeast of the European USSR, in Central Asia, and in the southern parts of West and East Siberia. The opposite picture in runoff distribution over the USSR is observed in periods of westerly stratospheric flow in the equatorial region. (Humphreys-ISWS)
W74-13011

SIMULATION OF RAINFALL SEQUENCES,
Auckland Univ. (New Zealand).
For primary bibliographic entry see Field 2B.
W74-13013

ESTIMATION OF AREA AND CIRCUMFERENCE OF SMALL WETLANDS,
Canadian Wildlife Service, Saskatoon (Saskatchewan).
J. B. Millar.
J Wildl Manage. Vol 37, No 1, p 30-38, 1973. Illus.

Descriptors: *Wetlands, Areal, Dimensions, Size.
Identifiers: Circumference.

Maximum contour length and width measurements were used in formulas for the area and circumference of an ellipse to estimate the area and circumference of 441 individual contours from 71 wetland basins. Contours were measured from maps, first, as single ellipses and, secondly, as either single or multiple ellipses depending upon their irregularity in shape. The latter method produced calculated values for simple and multielliptical contours which, on the average, deviated from actual values by +3.7 and +3.1%, respectively, for area and -2.3 and -0.3%, respectively, for circumference. Circumference per acre derived from calculated area and circumference values had mean deviations of -5.7 and -3.0%, respectively. Ninety-five percent of all calculated values were within 13% of actual values. Methods are suggested for using the technique in the field. (See also W72-05481)--Copyright 1973, Biological Abstracts, Inc.
W74-13033

SEVERITY AND FREQUENCY OF DROUGHT IN MISSISSIPPI,
Mississippi State Univ., State College. Dept. of Agricultural and Biological Engineering.
For primary bibliographic entry see Field 2B.
W74-13052

THE MATHEMATICAL MODELING OF SOIL-WATER-NITROGEN PHENOMENA,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-13138

ARIZONA CLIMATE, 1931-1972.
For primary bibliographic entry see Field 2B.
W74-13139

DESERT ECOSYSTEMS: ENVIRONMENT AND PRODUCERS,
Hebrew Univ., Jersualem (Israel). Dept. of Botany.
I. Noy-Meir.
Annual Review of Ecology and Systematics, Vol 4, p 25-51, 1973. 4 fig, 119 ref.

Descriptors: *Ecosystems, *Deserts, *Model studies, Arid lands, Rainfall, Sptial distribution, Water balance, Desert plants, Arid climate, Infiltration, Runoff, Storage capacity, Drainage, Transpiration, Evaporation, Biomass, Salinity, Soil water, Stochastic processes, Energy conversion.

An examination of knowledge on structure and functions of desert ecosystems was made, particularly of those distinctly characteristic of arid ecosystems which are defined as water controlled...with infrequent, discrete, and largely unpredictable inputs. The possibility of using common characteristics for systems analysis and simulation modelling was also investigated. (Mastic-Arizona)
W74-13150

ECOLOGICAL SURVEY OF THE VENEZUELAN WESTERN LLANOS: I. THE REGIONAL ECOLOGICAL UNITS, (IN SPANISH),
Universidad de Los Andes, Merida (Venezuela). Facultad de Ciencias.

For primary bibliographic entry see Field 6G.
W74-13355

2B. Precipitation

STRUCTURE AND MECHANISM OF PRECIPITATION AND THE EFFECT OF OROGRAPHY IN A WINTERTIME WARM SECTOR,
Royal Radar Establishment, Malvern (England). Meteorological Office Research Unit.
K. A. Browning, F. F. Hill, and C. W. Pardoe.
Quarterly Journal of the Royal Meteorological Society, Vol 100, p 309-330, July 1974. 12 fig, 1 tab, 25 ref.

Descriptors: *Precipitation intensity, *Storm structure, *Synoptic analysis, Radar, Radiosondes, Rain gages, Precipitation(Atmospheric), Orography, Winter, Rainfall, Hills.
Identifiers: *Warm sector precipitation, Potential instability, Orographic precipitation, Wales, England, British Isles.

A case study was presented showing the three-dimensional structure and evolution of precipitation upwind, over, and downwind of the south Wales hills during the passage of a wintertime warm sector that gave rather heavy and prolonged rainfall. The precipitation structure was synthesized from a network of weather radars and autographic raingauges. The stucture was interpreted within a dynamical framework derived from routine upper air soundings supplemented by serial ascents upwind and downwind of the hills. The warm sector was characterized by a fast-moving airstream with potential instability, not only at low levels due to its passage over a warm sea, but also in the middle troposphere. The middle-level potential instability was due to differential thermal advection in an intense and nearly vertical baroclinic zone that extended ahead of the surface cold front at middle levels. Forecasting techniques that predict rainfall on the basis of forecast large-scale vertical ascent may fail to identify some important situations of orographic warm sector rain unless the interaction of potential instability and orography is realistically taken into account. (Jones-ISWS)
W74-12975

COMPARISON OF MEAN RAIN CATCH OF VARIOUS GAUGE NETWORKS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wassertau, Hydrologie und Glaziologie.
B. Sevruk.
Nordic Hydrology, Vol 5, p 50-63, 1974. 4 fig, 6 tab, 18 ref.

Descriptors: *Rain gauges, *Instrumentation, *Isohyetes, Networks, Precipitation gages, Winds, Wetting, Mountains, Slopes, Basins, Maps, Precipitation(Atmospheric), Rainfall.
Identifiers: *Rain gage comparison, *Stereo rain gages, Wind effects, Wetting errors, Mountain terrain.

After the substitution of stereo for horizontal orifices of rain gauges on open steep slopes, the mean network catch in a subbasin with prevailing windward exposure was increased by 11%. In a subbasin with leeward exposure it was increased by only 4%. The mean network catch of ground level stereo gauges corrected for wetting losses was about 17% greater than that of elevated gauges with horizontal orifices. There was little difference between the mean network catch of ground level stereo gauges in the two subbasins. The isohyetal map from the data of these gauges was less complicated than the map drawn from the data of elevated gauges with horizontal orifices in the same subbasin. (Jones-ISWS)
W74-12976

A PROCESSING SYSTEM FOR FISCHER AND PORTER PRECIPITATION GAUGE DATA,
Atmospheric Environment Service, Downsview (Ontario).
For primary bibliographic entry see Field 7C.
W74-12977

RAINFALL FREQUENCY VALUES FOR KENTUCKY.
Dept. of Natural Resources, Kentucky. Div. of Water.
For primary bibliographic entry see Field 7C.
W74-12979

REMOTE SENSING OF THE MOISTURE CONTENT OF THE ATMOSPHERE AND UNDERLYING SURFACE,
For primary bibliographic entry see Field 7B.
W74-12982

ONE-DAY EXTREME RAINFALL STATISTICS FOR THE PRAIRIE PROVINCES,
Atmospheric Environment Service, Downsview (Ontario).
D. M. Pollock, and G. J. Gaye.
Publication No CLI-5-73, 1973. 26 p, 21 fig, 1 tab, 18 ref.

Descriptors: *Rainfall, *Excessive precipitation, *Statistics, Probability, *Canada, Maps, Precipitation.
Identifiers: *Gumbel method, *Extreme rainfall statistics, Manitoba, Saskatchewan, Alberta, Prairie provinces.

Maps are presented giving the one-day extreme rainfalls for the Prairie Provinces with return periods of 2, 5, 10, 25 and 100 years calculated by the Gumbel method. In addition, maps are presented giving the mean and standard deviation of the annual series of maximum one-day rainfalls. These maps are based on all available data prior to 1972 from 1061 stations in the Prairie Provinces equipped with standard, nonrecording rain gauges. The general pattern was for the heaviest rainfalls to occur in southwestern Manitoba and along the foothills of the Rocky Mountains in Alberta, while the smallest extreme rainfalls occurred in the northern regions. (Jones-ISWS)
W74-13000

THE ACCURACY OF RADAR-DERIVED RAINFALL MEASUREMENTS IN HILLY TERRAIN,
British Meteorological Office, Bracknell (England).
T. W. Harrold, E. J. English, and C. A. Nicholass.
Quarterly Journal of the Royal Meteorological Society, Vol 100, p 331-350, 1974. 7 fig, 6 tab, 13 ref.

Descriptors: *Radar, *Rain gages, *Rainfall, Instrumentation, Measurement, Reliability, Wind, Hydrology, Meteorology, Sampling, Meteorological data.
Identifiers: *Radar-rainfall relationships, *Accuracy of radar measurement, Raingage density, Wales, River Dee(Wales), Hilly terrain, Areal rainfall.

A weather radar was used to measure rainfall over hilly terrain in north Wales. The radar was a standard Plessey Type-43S, which had a wavelength of 10 cm and a beam width to half power points of 2 degrees. Measurements were compared with those based on a raingauge network consisting of 62 tipping bucket gauges distributed over 1000 sq km. Errors in the radar estimates were excessive unless the radar was calibrated hourly using raingauge measurements from one site. The accuracy was further increased when the horizontal drift of the rain in the wind between the radar beam and the calibration site was allowed for. The main causes of error in the radar measurements seemed to be: (1) variations in the drop size distribution relations; (2) the spatial variation in the growth (or evaporation) which occurred between the beam and the ground; and (3) the horizontal drift of the rain in the wind. Probably all of these factors, but in particular the second item, were more important in the hilly terrain than would be the case in flatter terrain. The mean percentage differences between the radar estimates and optimum estimates of rainfall for varying distances, time periods, and areal sizes were given. (Schickedanz-ISWS)
W74-13009

SIMULATION OF RAINFALL SEQUENCES,
Auckland Univ. (New Zealand).
A. J. Raudkivi, and N. Lawgun.
Journal of Hydrology, Vol 22, No 3-4, p 271-294, 1974. 8 fig, 7 tab, 7 ref.

Descriptors: *Simulated rainfall, *Statistical methods, *Rainfall disposition, *Analytical techniques, Markov processes, Time series analysis, Spatial distribution, Correlation analysis, Sampling.
Identifiers: *Rainfall duration, *Rainfall interval, Pearsonian III distribution, Frequency distribution.

A stochastic model for the generation of rainfall sequences based on 10-minute time units was developed. The time series contained deterministic and stochastic components, and was modeled as a first- or second-order Markov process. The parameters for the deterministic component were obtained by correlation and regression analyses. The random component was approximated by a Pearsonian III distribution. The observed rainfall sequences were assumed to form a homogeneous and stationary time series for any particular month of the year. The basic variables in the stochastic rainfall model were the amount of rainfall, the duration of rainfall, and the interval between two successive rainfalls. It was inferred from rainfall data at three climatologically different locations that the interval length could be assumed independent of the amount and duration of rainfall. However, a strong correlation was indicated between the amount and duration of rainfall. The proposed stochastic model was used to generate rainfall at intervals sampled from the observed cumulative distribution of the intervals. The means and standard deviations of generated rainfalls were in good agreement with the corresponding values from the observed rainfalls. (Singh-ISWS)
W74-13013

SEVERITY AND FREQUENCY OF DROUGHT IN MISSISSIPPI,
Mississippi State Univ., State College. Dept. of Agricultural and Biological Engineering.
J. C. McWhorter.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 419, $3.75 paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1974. 36 p, 22 fig, 5 tab, 6 ref, append. OWRT A-075-MISS(1).

Descriptors: *Droughts, Water balance, Statistics, *Mississippi, *Climatic data, *Frequency, Distribution *Regression analysis, Monthly.
Identifiers: *Drought severity, Drought frequency.

The objectives of the study were to determine drought periods and classify their severity for ten geographic areas in the state of Mississippi, and to analyze the severity data in order to determine the return period associated with a specific degree of severity. These objectives were accomplished by using monthly climatological data for Mississippi and a drought model which expressed monthly severity in terms of an index value. These values were determined for ten districts in Mississippi for each month of the period 1899-1970. Findings are expressed in graphical form and depict duration and severity of drought, distributions, and recur-

rence intervals. The severity data were treated as an annual series and fitted to an equation of the form Y = a + b log X, where Y = severity index and X = return period in years, using a least-squares regression procedure. The coefficients of determination, R-square, were in the range 0.88 - 0.96 for the ten districts. For all districts, a severity index value of -1.9 (mixed drought) can be expected to be equaled or exceeded in 2 years; -2.8 (moderate drought), in 5 years; -3.6 (severe drought), in 10 years; and -4.5 (extreme drought), in 25 years.
W74-13052

ARIZONA CLIMATE, 1931-1972.
University of Arizona Press, Tucson, Revised, Second edition, 1974. W. D. Sellers and R. H. Hill, editors. 616p. 15 fig, 7 tab, 52 ref.

Descriptors: *Climatic data, *Arizona, *Precipitation(Atmospheric), *Weather data, Humidity, Clouds, Winds, Average, Seasonal, Evaporation.

A revision of the 1964 edition of Arizona climate uses complete climatic summary data furnished by approximately 1,000 cooperating weather observers throughout the state for 150 sites, and abbreviated summaries for 183 more. Coverage is for 1931 through 1972, although averages are computed only for the 30-year period 1941-1970, consistent with National Weather Service practice of recomputing 30-year normals every 10 years. A summary of outstanding weather events in Arizona, 1963-1973, is included, along with descriptions of the State's physical features, precipitation, temperature, relative humidity and the temperature-humidity index, surface winds, cloudiness, and evaporation. Typical information on stations includes means and extremes for temperature: month, daily minimum and maximum, monthly average, highest and lowest records with years. For precipitation, data include: mean, total, greatest daily with year, maximum monthly with year. There is a column on estimated mean relative humidity. For most stations, there are comprehensive descriptions of the climate prevailing in those particular locales. Tabulated station histories, 1931-1972, give coordinates, elevation, distance and direction from post office, observer, dates, and other information. (Paylore-Arizona)
W74-13139

EXPERIMENTS SUPPORTING A PROGRAM OF WARM FOG DISPERSAL BY ELECTRICAL CHARGE INJECTION,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 3B.
W74-13216

SEASONAL EFFECTS IN FLOOD SYNTHESIS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W74-13298

AVAILABLE SOIL WATER: TIME-DISTRIBUTION IN A WARM SEASON RANGELAND,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2G.
W74-13403

A DEWPOINT HYGROMETER FOR WATER POTENTIAL MEASUREMENT,
Wescor, Inc., Logan, Utah.
For primary bibliographic entry see Field 7B.
W74-13407

POTENTIAL PASTURE PRODUCTION IN THE UPLANDS OF WALES: I. CLIMATIC VARIATION,
Welsh Plant Breeding Station. Agricultural Research Council, Aberystwyth(Wales).
For primary bibliographic entry see Field 3F.
W74-13454

2C. Snow, Ice, and Frost

THE INFLUENCE OF WATER TRANSPORT AND TRANSFER OF HEAT BY FREEZING AND DEFROSTING ON SOIL GENESIS,
Akademiya Nauk SSSR, Moscow. Institut Agrokhimii i Pochvovedeniya.
For primary bibliographic entry see Field 2G.
W74-12852

AN IMPROVED SNOW STUDY KIT,
Maine Cooperative Fishery Unit, Orono.
For primary bibliographic entry see Field 7B.
W74-12967

FORECASTING DISCHARGE FROM A GLACIATED BASIN IN THE SWISS ALPS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
H. Jensen, and H. Lang.
International Association for Scientific Hydrology, Gentbrugge, Belgium, Publication No 107, p 1047-1054, 1973. 3 fig, 7 ref.

Descriptors: *Glaciohydrology, *Water sources, *Runoff forecasting, *Ablation, Runoff, Discharge(Water), Glaciers, Melting, Climatology, Air temperature, Precipitation(Atmospheric), Solar radiation, Vapor pressure, Daily hydrographs, Hydrology, Snow, Ice, Melt water.
Identifiers: *Switzerland, Glaciation basins, Swiss Alps, Pennine Alps(Valais).

The runoff from a glaciated region in the catchment area of a hydroelectric power plant was studied with regard to shortrange forecasts of the discharge. The forecasts were based on regression equations employing the following predictors: discharge, air temperature, precipitation, global radiation, and vapor pressure. The process was not stationary because the hydrological conditions vary in the course of the ablation season. This was taken into account by subdividing the melt season into three intervals by physical criteria and by considering the residuals of preliminary regression equations. Each of the final equations was valid only in one interval. (Humphreys-ISWS)
W74-12974

CLASSIFICATION AND VARIATION OF SEA ICE RIDGING IN THE WESTERN ARCTIC BASIN,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, III., S. J. Mock, and W. B. Tucker, III.
Journal of Geophysical Research, Vol 79, No 18, p 2735-2743, June 20, 1974. 5 fig, 5 tab, 18 ref, append. DA Project, 4A161102B52E.

Descriptors: *Sea ice, *Mathematical models, *Arctic Ocean, Distribution patterns, Profiles, Surfaces, Regression analysis, Evaluation, Basins, Temporal distribution, Spatial distribution, Frequency analysis.
Identifiers: *Arctic Basin(Western area), *One-parameter model, Sea ice ridging, Ridge height.

A one-parameter model for pressure ridges was developed and compared, with good agreement, with over 3000 km of laser profile data taken from November 1970 to February 1973 in the Arctic basin. Comparisons were also made with a previously developed two-parameter model. The number of ridges per kilometer at any height level may be well predicted from the one-parameter model by using a parameter called ridging intensity which may be determined for a region from the mean number of ridges per unit length and the mean ridge height. Regional and temporal variations in ridging intensity in the western Arctic basin were studied. Results indicated that although magnitudes of ridging intensity vary in time, the relative regional variations were similar. Consequently, three distinct regions of ridging intensity having relatively stable boundaries can be defined. Annual variation in new ice production due to ridging was sufficiently large to suggest that ridging plays an important role in the overall mass balance of the Arctic basin. (Humphreys-ISWS)
W74-12991

ICEBREAKING BY TOW ON THE MISSISSIPPI RIVER,
Cold Regions Research and Engineering Lab., Hanover, N.H.
G. D. Ashton, S. L. DenHartog, and B. Hanamoto.
Available from NTIS, Springfield, Va. 22161 as AD-768 169, Price $4.25 printed copy, $2.25 microfiche. Special Report No 192, August 1973. 72 p, 59 fig, 11 tab, 5 ref, 3 append. ED-24-72-R1, R2, and R3.

Descriptors: *Ice cover, *Icejams, *Mississippi River, *Navigation, Transportation, Measurement.
Identifiers: *Icebreaking, *River ice.

A field investigation of icebreaking on the Mississippi River between Alton, Illinois, and Fort Madison, Iowa, encountered a wide variety of ice conditions and was performed with a variety of barge configurations and arrangements. Qualitative observations of the nature and difficulties encountered while icebreaking are given. By instrumenting the propeller shafts and using load cells between the towboat and the barges, quantitative information was obtained on the resistance encountered while icebreaking. The effects of repeated passage through an ice cover, navigation procedures peculiar to icebreaking, and minor damage sustained by the towboat are described. (Knapp-USGS)
W74-13170

EXPERIMENTAL DEVELOPMENT OF POTABLE WATER SUPPLY FOR NEW SOUTH POLE STATION,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 4B.
W74-13197

ICE PROJECT-ICE CRYSTAL INHIBITION-AN APPLICATIONS PROGRAM OF CHEMICAL DISPERSAL IN SMALL CUMULUS CLOUDS,
Atmospherics, Inc., Fresno, Calif.
For primary bibliographic entry see Field 3B.
W74-13212

RECONNAISSANCE LIMNOLOGY OF SUB-ANTARCTIC ISLANDS: I. CHEMISTRY OF LAKE WATERS FROM MACQUARIE ISLAND AND THE ISLES KERGUELEN,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 2H.
W74-13389

2D. Evaporation and Transpiration

TRANSPORT PHENOMENA CONTROLLING EVAPORATION FROM SOIL,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
W. J. Staple.

In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 566-573, 1972. 5 fig, 10 ref.

Descriptors: *Evaporation, *Air-earth interfaces, *Soil water movement, Hydraulic conductivity, Hysteresis, Wetting, Drying, Soil moisture.

Laboratory tests were made involving combinations of three depths of infiltration and four initial periods of redistribution. Evaporation losses from soil columns could be predicted in terms of physical data provided that the hydraulic conductivity near the surface was reduced relative to that of the bulk sample. The change in K was caused by entrapped air and swelling or heaving of the unconfined surface during rapid infiltration. The experiments were conducted without direct radiation but the potential evaporation was increased for five hours each day by means of a fan. The isothermal model was assumed in the computations. (See also W74-12811) (Knapp-USGS)
W74-12845

EFFECT OF SOIL SALINITY ON THE RATE OF EVAPORATION,
Baghdad Univ. (Iraq). Coll. of Agriculture.
For primary bibliographic entry see Field 2G.
W74-12846

RELATIONSHIP BETWEEN THE HYDROLOGY, FLUID CHEMISTRY AND DIAGENETIC MINERAL FORMATION IN THE COASTAL AREAS OF THE PERSIAN GULF,
Ontario Water Resources Commission, Ottawa.
For primary bibliographic entry see Field 2L.
W74-12851

COMPARISONS OF MEASURED AND ESTIMATED DAILY POTENTIAL EVAPOTRANSPIRATION IN A HUMID REGION,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
L. H. Parmele, and J. L. McGuinness.
Journal of Hydrology, Vol 22, No 3-4, p 239-251, 1974. 4 tab, 26 ref.

Descriptors: *Evapotranspiration, *Transpiration, Potential flow, Lysimeters, Energy budget, Meteorological data, Climatic data, Precipitation(Atmospheric).
Identifiers: *Net radiation, *Potential evapotranspiration, Coshocton(Ohio), Regression statistics.

Various meteorological methods for computing daily potential evapotranspiration (PET) were used during the summers of 1968 and 1969 with daily totals of continuous micrometeorological measurements made over one of the monolith lysimeters at Coshocton, Ohio. The results of daily potential ET calculations and the general agreement of these estimates with lysimeter values of ET indicated that evapotranspiration from corn and clover crops was at potential condition during the periods of observation. Estimates of PET made with various versions of the combination equation that utilized measured net or solar radiation were superior to estimates made with the other methods tested. A daily value of net radiation was a good measure of evapotranspiration when conditons were at potential. In one version of the combination equation, 'true' crop roughness parameters were utilized, which gave a good fit for the clover data but an over-predicted potential ET for corn by 44%. A modified combination equation developed at Coshocton, Ohio for predicting actual ET was tested with data independent of that used in the derivation. The successful application of this equation, be used to estimate daily ET in the humid northeastern United States from climatic data. (Roberts-ISWS)
W74-12988

EVAPOTRANSPIRATION OF WATER HYACINTH (EICHHORNIA CRASSIPES),
Landbouwproefstation, Paramaribo (Surinam).
R. Van Der Weert, and G. E. Kamerling.
Journal of Hydrology, Vol 22, No 3-4, p 201-212, 1974. 6 fig, 2 tab, 16 ref.

Descriptors: *Water hyacinth, *Evapotranspiration, Evaporation, Water consumption, Water loss, Solar radiation, Transpiration, Evaporation pans, Consumptive use, Energy budget, South America.
Identifiers: *Surinam(Paramaribo), *Surinam(Brokopondo Lake), Free water evaporation, Water blooms.

Water balance measurements made near the Agricultural Experiment Station at Paramaribo and on the Brokopondo Lake, located on the northeast coast of South America, showed that the evapotranspiration of water hyacinth appeared to be respectively 48% and 44% higher than free water evaporation. These values were much lower than expected based upon values given in previous literature. This discrepancy was explained to a large extent by border effects in the experiments cited. Calculations with a Penman-type formula, in which the crop characteristics were estimated from the Brokopondo Lake data, showed that the ratio between evapotranspiration and free water evaporation decreases with increasing amounts of solar energy and increases with increasing vapor pressure deficits. (Roberts-ISWS)
W74-12998

WATER BUDGET ESTIMATION IN BELLARY REGION,
Indian Council of Agricultural Research, Bellary. Southern Regional Soil Conservation Research Sub-Station.
N. S. Jayoram, B. Ramanath, and B. Verma.
Annals of Arid Zone, Vol 12, No 1 and 2, p 51-58, March and June, 1973. 1 fig, 3 tab, 9 ref.

Descriptors: *Hydrologic budget, *Moisture deficit, *Evapotranspiration, *Irrigation water, Precipitation(Atmospheric), Soils, Soilwater, Bulk density, Field capacity, Root zone, Wilting point, Meteorological data, Runoff, Percolation, Seepage, Drought, Arid climates.
Identifiers: *Penman's equation, *India(Bellary region).

A water budget was formulated using Penman's equation to compute potential evapotranspiration in the Bellary Region. Certain meteorological parameters such as air temperature, relative humidity, radiation, and wind velocity were used to compute the potential evapotranspiration. This project was undertaken to determine the optimum plan for utilization of irrigation water. Results showed a mean deficit of 136.92 centimeters annually over a ten-year period from 1957-58 to 1967-68. Annual precipitation was found to supply approximately two-sevenths of the total requirements of the Bellary Region. (Mastic-Arizona)
W74-13145

ROLE OF CLASS A PAN IN ESTIMATING NATURAL EVAPORATION AND EVAPOTRANSPIRATION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
M. S. Kettaneh, N. A. Zaki, and G. F. Kaka.
Technical Bulletin 67, August 1974. 12 p, 1 fig, 3 tab, 10 ref.

Descriptors: *Evaporation pans, *Evapotranspiration, Evaporimeters, Meterological data, Irrigation, Temperature, Precipitation(Atmospheric).
Identifiers: *Penmsn's formula, 'Kohler's coaxial technique, *Drag.

Pan-coefficients have been worked out for potential evapotranspiration, free water surface evaporation, and shallow lakes evaporation on a monthly basis, and for the year July 1969 to June 1970 as a whole. A modified Penman's formula was used to compute the first two coefficients, and Kohler's coaxial technique was used for the third coefficient. All were computed from meterological data including temperatures, precipitation, radiation and air moisture data. Results may be used to simulate, as realistically as possible, conditions that occur in agriculture, irrigation, and hydrology. (Mastic-Arizona)
W74-13153

TRANSPIRATION INTENSITY AND PRODUCTIVITY OF WILD AND CULTIVATED MEADOW PLANTS IN SOUTHWESTERN KYZYLKUM, (IN RUSSIAN),
D. A. Maisarov.
Uzb Biol Zh. Vol 16, No 4, p 31-33, 1972.
Identifiers: Kyzylkum, Meadows, *Transpiration.

The study showed varying productivity of wild and cultivated meadow plants under identical moisture conditions. A 4-fold increase in fodder grass production may be obtained by selecting species which optimally utilize moisture.--Copyright 1973, Biological Abstracts, Inc.
W74-13246

THE INFLUENCE OF AGROTECHNICAL FACTORS ON THE EVAPOTRANSPIRATION OF RICE, (IN HUNGARIAN),
University of Agriculture, Godollo (Hungary). Dept. of Crop Production and Soil Cultivation.
V. K. Vamadevan.
Acta Agron Acad Sci Hung. Vol 22, No 1/2, p 137-142. 1973.
Identifiers: Nitrogen, Rice, *Evapotranspiration.

Two water depths, each with 2 N levels and 2 plant populations were compared during 2 rice growing seasons as to their influence on the ET evapotranspiration of rice. ET was measured by embedding galvanized iron tanks in the rice field. An increase in the water depth caused significant increase in ET during the early period of growth. In the later period, there was no difference. ET was significantly different at the 2 levels of plant population at both water depths. The effect of N levels on ET was not consistent. However, the trend was that high N levels increased the ET at a 5-cm water depth. The opposite was true at a 20-cm water depth.--Copyright 1973, Biological Abstracts, Inc.
W74-13255

THE RELATIONSHIP BETWEEN RICE EVAPOTRANSPIRATION AND DRY MATTER PRODUCTION, (IN HUNGARIAN),
University of Agriculture, Godollo (Hungary). Dept. of Crop Production and Soil Cultivation.
V. K. Vamadevan.
Acta Agron Acad Sci Hung. Vol 22, No 1/2, p 175-179. 1973, Illus.
Identifiers: Nitrogen, Rice, *Evapotranspiration.

The water use efficiency was increased at high plant density levels at the 5- and 20-cm water depths. The N levels and water depths did not influence efficiency. The yield ET evapotranspiration relationship gave a linear increase in water use efficiency with increasing yield.--Copyright 1973, Biological Abstracts, Inc.
W74-13257

SOME REMARKS CONCERNING THE ACTION OF IAA ON TRANSPIRATION EXAMINED AT THE FIRST VEGETATIVE STAGE OF TRITICUM DURUM VAR. OUED ZENATI 368, (IN POLISH),
Instytut Hodowli i Aklimatyzacji Roslin, Warsaw (Poland). Zaklad Biofizyki Roslin.
W. Nowakowski.
Bull Acad Pol Sci Ber Scz Biol. Vol 21, No 2, p 165-169. 1973, English summary.

Identifiers: IAA, *Transpiration, Triticum-Durum, Wheat.

The effects of IAA on transpiration and on water content in leaves and stalks of 10- and 20-days seedlings of T. durum cv. Oued Zenati were investigated. The wet and dry weights of the leaves, stems and roots of the wheat were determined. The experiment was made under laboratory conditions in crystallizers containing 500 g of red soil. Thirty, 40 and 60% of capillary soil capacity was maintained during the experiment. IAA during drought (30% capillary soil capacity) lowered the transpiration coefficient, and dry weight of the plants slightly increased.--Copyright 1973, Biological Abstracts, Inc.
W74-13259

THE WATER REGIME OF FLOWERS, (IN RUSSIAN),
Ryazanskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
N. I. Antipov.
Bot Zh, Vol 57, No 10, p 1327-1332, 1973, Illus.
Identifiers: *Flowers, *Transpiration, Water supply.

The petals of some flowers have a higher water content and transpiration rate than leaves. A good water supply is needed during the blooming period.--Copyright 1973, Biological Abstracts, Inc.
W74-13381

CONTRIBUTIONS TO THE WATER RELATIONS OF OLIVE UNDER SEMI-ARID CONDITIONS,
Ain Shams Univ., Cairo (Egypt). Dept. of Botany.
A. A. El-Rahman, E. Abd, H. Nadia, and A. H. Hassan.
Flora (Jena), Vol 162, No 1/2, p 99-107, 1973, Illus.
Identifiers: *Arid climates, *Transpiration, Leave, *Olive trees, Stomata.

This study aimed to show how much microclimatic condtions, leaf age and moisture stress affect the transpiration intensity and stomatal movement in olive trees. The top leaves exposed to sun and air currents for a longer period during the day exhibited a relatively high transpiration intensity, whereas leaves in the center which were shaded and protected from air currents showed the lowest transpiration intensity associated with the narrowest stomatal opening. East-facing leaves had maximum transpiration rates in the forenoon, whereas west-facing ones exhibited maximum transpiration in the afternoon. Stomatal movement showed the same trend as transpiration rate. Yound leaves had lower transpiration intensity and narrower stomatal apertures than mature leaves. Transpiration intensity was markedly suppressed in trees subjected to adverse moisture conditions. Sampling to estimate, the water output of a tree should include leaves from different parts of the tree and of different ages.--Copyright 1973, Biological Abstracts, Inc.
W74-13382

ESTIMATING SOLAR RADIATION ON MOUNTAIN SLOPES,
Forest Service, (USDA), Franklin, N.C. Southeastern Forest Experiment Station.
L. W. Swift, Jr., and K. R. Knoerr.
Agricultural Meteorology, Vol 12, No 3, p 329-336, December 1973. 3 fig, 1 tab, 27 ref.

Descriptors: *Solar radiation, *Slopes, *Estimating equations, Model studies, Mountains, Clouds, Climatic data, *North Carolina.
Identifiers: Atmospheric transmission.

The amount of solar irradiation on a mountain slope is an important parameter for describing the climatology of a sloping site, but measurements of such radiation are not easily obtained. Daily totals of solar irradiation can be estimated by using published tables of potential solar irradiation if the effects of atmospheric transmissivity and cloud cover are included. Daily totals of solar irradiation on the slope were estimated as the product of the ratio of potential solar irradiation for the slope to the potential for a horizontal surface times the daily total of global solar radiation measured on a horizontal surface at a site near enough to have the same cloud cover as the mountain slope. A test of this method shows that valid estimates of solar radiation input were obrained for two opposite-facing slopes.
W74-13415

PHOTOSYNTHESIS, DIFFUSION RESISTANCE AND RELATIVE PLANT WATER CONTENT OF COTTON AS INFLUENCED BY INDUCED WATER STRESS,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
For primary bibliographic entry see Field 3F.
W74-13457

EFFECTS OF LOW SOIL TEMPERATURE ON TRANSPIRATION, PHOTOSYNTHESIS, LEAF RELATIVE WATER CONTENT, AND GROWTH AMONG ELEVATIONALLY DIVERSE PLANT POPULATIONS,
J. E. Anderson, and S. J. McNaughton.
Ecology, Vol 54, No 6, p 1220-1233, 1973, Illus.

Descriptors: *Transpiration, *Photosynthesis, Growth rates, *Soil temperature, *Moisture content, Leaves, Roots.

The effects of low soil temperature on photosynthesis and water relations were examined in 17 populations of 12 vascular plant species (Achillea borealis, Horkelia fusca, Salix scouleriana, Solidago spathulata, Mimulus cardinalis, Agropyron spicatum, Geum triflorum Salix sp., Achillea millefolium, G. rivale, Salix eastwoodiae, Solidago multiradiata) from native elevations ranging between 10 m and 3170 m. Root permeability to water was sufficient in the majority of populations studied so that neither transpiration nor net photosynthesis was reduced at 3C soil temperature compared to the rates at 20C soil temperature. There was no evidence of differential natural selection along altitudinal gradients for ability to maintain photosynthetic rate when roots were chilled. Leaf relative water content was typically reduced in response to soil cooling. There is a critical relative water content above which both transpiration and photosynthesis are insensitive to water content reductions. Root chilling failed to reduce relative water content below this level in most populations studied. Low soil temperatures which had no adverse effects on transpiration or photosynthesis were found to significantly retard plant growth. The observed relative water content reductions might limit growth despite their failure to affect photosynthesis. Evidence for natural selection for ability to maintain turgor upon root chilling in high elevation populations was provided by an inverse relationship between the magnitude of depression in relative water content and native elevation. Growth reduction at low soil temperatures must result from impaired turgur, decreased root growth and metabolism or impaired cytokinin synthesis and translocation rather than direct limitation of carbon assimilation.--Copyright 1974, Biological Abstracts, Inc.
W74-13492

2E. Streamflow and Runoff

THE CHEMICAL COMPOSITION AND FLOW OF THE RIVER FROME AND ITS MAIN TRIBUTARIES,
Freshwater Biological Association, Wareham (England). River Lab.
For primary bibliographic entry see Field 2K.
W74-12928

FORECASTING DISCHARGE FROM A GLACIATED BASIN IN THE SWISS ALPS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
For primary bibliographic entry see Field 2C.
W74-12974

SPATIAL PATTERNS OF LONG-PERIOD STREAMFLOW FLUCTUATIONS IN THE EUROPEAN USSR,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 2A.
W74-12981

ERRORS OF AERIAL SURVEY OPERATIONS AND OFFICE PROCESSING OF DATA IN AIRCRAFT MEASUREMENTS OF DISCHARGES,
For primary bibliographic entry see Field 7C.
W74-12986

THREE-DIMENSIONAL STRUCTURE OF STORM-GENERATED CURRENTS,
Shell Development Co., Houston, Tex.
For primary bibliographic entry see Field 2L.
W74-12992

MODELLING OF SURFACE RUNOFF SYSTEMS BY AN ARMA MODEL,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-12993

PROBABILITY DISTRIBUTION OF OUTFLOW FROM A LINEAR RESERVOIR,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 4A.
W74-13001

STATE VARIABLE MODEL OF OVERLAND FLOW,
Alberta Dept. of Environment, Edmonton. Div. of Technical Services.
For primary bibliographic entry see Field 2A.
W74-13008

QUASI-BIENNIAL STREAMFLOW VARIATION IN THE USSR,
For primary bibliographic entry see Field 2A.
W74-13011

HYDROLOGY AND WATER RESOURCES OF THE DEERFIELD RIVER BASIN, MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13016

ANALYSIS OF URBAN LAND TREATMENT MEASURES FOR FLOOD PEAK REDUCTION,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-13043

UNIT STREAM POWER FOR SEDIMENT TRANSPORT IN NATURAL WATERS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2J.
W74-13049

FLOOD OF JUNE 1964 IN THE OLDMAN AND MILK RIVER BASINS, ALBERTA,
Department of the Environment, Ottawa, (Ontario). Inland Waters Directorate.

L. A. Warner.
Technical Bulletin No 73, 1973. 89 p, 35 fig, 13 photo, 4 tab, 6 ref, 2 append.

Descriptors: *Floods, *Historic floods, *Canada, *Montana, Peak discharge, Flood frequency, Flood data, Depth-area-duration analysis, Meteorology, Rainfall-runoff relationships, Meteorological data.
Identifiers: *Oldman River(Alberta), *Milk River(Alberta).

Severe flooding occurred in June 1964 as a result of historical maximum peak discharges in the headwaters of many streams in Montana and Southwestern Alberta. The flooding was caused by a storm that extended along the foothills, parallel to the eastern slope of the Rocky Mountains, and 200 miles northward from Helena Mountain. In addition to the basic streamflow and other pertinent data, background information and some flood analysis are presented. A location map shows the area affected by the flood along with stream gaging, meteorological observation and snow course stations. The Upper South Saskatchewan and Milk River drainage basins and the flood of June 1964 are described. Flood frequency analyses are given for several of the hardest hit streams in the area. (Knapp-USGS)
W74-13173

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT: VOLUME 4. HYDROGRAPH ANALYSIS,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
Available from NTIS, Springfield, Va 22161 as AD-774 261, Price $5.25 printed copy; $2.25 microfiche. Publication HEC-1HD-400, October 1973. 122 p, 24 ref.

Descriptors: *Hydrograph analysis, *Rainfall-runoff relationships, *International Hydrological Decade, Unit hydrographs, Snowmelt, Storm runoff, Runoff forecasting, Streamflow forecasting, Computer programs.

Practical techniques are given for analyzing precipitation, snowmelt, infiltration, and runoff processes as they relate to the computation of flood hydrographs. Topics discussed include: estimation of the areal depth and distribution of precipitation; calculation of runoff from snowmelt; determination of loss rates by linear and nonlinear functions; unit hydrograph theory and derivation; hydrograph reconstitution; and the estimation of unit hydrograph and loss rate coefficients for ungaged areas. Generalized computer programs are described for basin rainfall and snowmelt computations and unit hydrograph and loss rate optimization. (Knapp-USGS)
W74-13177

FLOODS OF JUNE 1972 IN THE HARRISBURG AREA, PENNSYLVANIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13186

FLOOD OF MARCH 1968 ON THE NEPONSET RIVER, MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13187

FLOODS IN CAPRON QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13188

FLOODS IN GARDEN PRAIRIE QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13189

FLOODS IN HARVARD QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13190

FLOOD OF MARCH 1968 ON THE IPSWICH RIVER, MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13194

RIVER MILE INDEX--COLORADO RIVER MAIN STEM AND TRIBUTARIES (LEES FERRY, ARIZONA, EXCEPT SAN JUAN RIVER).
Bureau of Reclamation, Denver, Colo. Upper Colorado Regional Office.
Pacific Southwest Inter-Agency Committee Report of the Water Management Technical Subcommittee, September 1974. 85 p, 1 map.

Descriptors: *Colorado River, River systems, Colorado River Basin, Arizona, Colorado, Wyoming, Utah, New Mexico, Southwest U.S.
Identifiers: *River mile index.

This river mile index for the Colorado River and tributaries from Lees Ferry to the headwaters is one of a series of reports for stream basins in the Pacific Southwest. It includes the Colorado main stem above Lees Ferry, tributaries in Colorado, Green River main stem and the Duchesne and Yampa River basins. River mileages were determined from independent measurements made on U.S. Geological Survey topographic quadrangles. Information on stream-gage locations, drainage areas, and water elevations at key points were obtained from the U.S. Geological Survey. River mile distances were measured upstream from the mouth to the nearest tenth mile. Mile 0.0 for the Colorado River is at the Lees Ferry USGS gaging station; mile 0.0 for all other streams is at the centerline of the stream to which it is contributary. Streams and points of interest were based on the volume of flow, size of drainage, and degree of development. (Knapp-USGS)
W74-13196

FLOOD SURVEYS ALONG TAPS ROUTE, ALASKA,
Geological Survey, Anchorage, Alaska.
J. M. Childers.
Basic-Data Report, 1974. 16 p, 1 fig, 1 tab, 24 ref.

Descriptors: *Floods, *Alaska, *Pipelines, Peak discharge, Arctic, Stage-discharge relations, Flood data, Hydrologic data.
Identifiers: Trans-Alaska Pipeline.

Flood data and a description of flood surveys are presented for 24 sites along the Trans-Alaska Pipeline System(TAPS) route from Prudhoe Bay to Valdez. Twenty-four channel sites at or near the TAPS centerline were surveyed during 1971-73. Sites selected were reasonably straight, uniform, alluvial channel reaches of larger streams where the pipeline design was considered to be sensitive to flood magnitude. Driftwood and other flood-deposited vegetal debris upon the overbank floodways were used as floodmarks to determine elevations of Maximum Evident Flood surfaces at the channel sites. (Knapp-USGS)
W74-13198

FLOODS OF JUNE 1965 IN ARKANSAS RIVER BASIN, COLORADO, KANSAS, AND NEW MEXICO,
Geological Survey, Washington, D.C.
R. J. Snipes.
Available from GPO, Washington, DC 20402, Price $2.35 (paper copy). Water-Supply Paper 1850-D, 1974. 97 p, 15 fig, 2 plate, 3 tab, 21 ref.

Descriptors: *Floods, *Colorado, *Kansas, *New Mexico, *Historic floods, Water levels, Flood frequency, Flood recurrence interval, Flood data, Stage-discharge relations.
Identifiers: *Arkansas River basin.

Maximum discharges during the floods of June 1965 in the Arkansas River basin in Colorado, Kansas, and New Mexico were greater than those previously known at 49 of the 137 locations where flood information was obtained. Property damage exceeded $60 million, and 16 lives were lost. At many sites, peak discharges exceeded by several-fold the discharges that may be expected, on the average, once in 50 years; yet, the 1965 discharges could be exceeded in the near future. Heavy rainfall of more than 12 inches and as much as 18 inches caused severe flooding in the Arkansas River basin in Colorado and Kansas and the Canadian River basin in New Mexico. Snowmelt runoff added only small amounts to the flood peaks. The 1965 peak discharges along the main stem of the Arkansas River in Colorado were less than those in 1921, but tributary peaks were probably greater at many sites. In New Mexico the peak discharges exceeded those for the destructive floods of 1904 at some locations, by manyfold at some sites. Descriptions of the storms and floods, detailed streamflow records, and information on damages and flood frequency are compiled. (Knapp-USGS)
W74-13207

SEASONAL EFFECTS IN FLOOD SYNTHESIS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W74-13298

A CONTINUUM MECHANICAL APPROACH TO THE FLOW EQUATIONS FOR MEMBRANE TRANSPORT: I. WATER FLOW,
Meharry Medical Coll., Nashville, Tenn. Div. of Biophysics and Neurobiology.
D. C. Mikulecky.
Biophys J, Vol 12, No 12, p 1642-1660, 1972, Illus.
Identifiers: Flow profiles, *Membranes, Filtration.

A concept is presented for modeling flows through membranes using continuum mechanics. Viscous interactions (due to velocity gradients) are explicitly incorporated and position-dependent local water-membrane interactions are taken into account before obtaining slab averages. This is in distinction to other treatments where strictly one-dimensional force balance equations are written using slab average friction coefficients which are really composite functions of local interactions. The viscous and other frictional interactions do not simply form linear combinations in the solutions to the the equations of motion. Flow profiles for pressure-driven flows ranging from Poiseuille's flow to diffusion flow are obtained depending on the strength and extent of the water-membrane interactions. The model is also applied to self-diffusion flows and the measurement of equivalent pore size. For a fixed pore size the ratio of filtration flow to self-diffusion flow for equal driving forces is able to vary over a wide range depending on the water-membranes interaction.--Copyright 1973, Biological Abstracts, Inc.
W74-13367

ECOLOGY OF UPPER CATCHMENT AREA OF RIVER NARMADA CLIMOVEGETATIONAL RELATIONSHIPS: I,
Saurashtra Univ., Rajkot (India). Dept. of Biosciences.
For primary bibliographic entry see Field 4A.
W74-13368

2F. Groundwater

FUNDAMENTALS OF TRANSPORT PHENOMENA IN POROUS MEDIA.
International Association for Hydraulic Research, Delft (Netherlands); and International Society of Soil Science, Amsterdam (Netherlands).
Available from Office of Continuing Education, Univ. of Guelph, Guelph, Ont., Canada Canadian $23.00 (2 Vol). Proc of 2nd International Symposium, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub (2 Vol), 1972. 797 p (total of Vols 1 and 2).

Descriptors: *Conferences, *Groundwater movement, *Soil water movement, Path of pollutants, Dispersion, Diffusion, Mixing, Hydrogeology, Filtration, Membrane processes, Infiltration, Saturated flow, Unsaturated flow.

The Second Symposium on Fundamentals of Transport Phenomena in Porous Media had the objective of attracting sceintists and engineers having a wide range of interests and backgrounds. Many disciplines are concerned with transport phenomena in porous media. Hydrologists are interested in groundwater movement and aquifer parameters; petroleum engineers are interested in secondary recovery processes in which petroleum is replaced by water or gas; chemical engineers are interested in filtration mechanisms and the behavior of reaction beds; textile researchers often consider fabrics as a porous material; and soil scientists have been interested in water movement as applied to infiltration, evaporation, drainage, salt leaching and plant uptake of water and nutrients. (See W74-12812 thru W74-12857) (Knapp-USGS)
W74-12811

OBSERVATIONS OF MIXING AND DIFFUSION IN POROUS MEDIA,
Mobile Research and Development Corp., Dallas, Tex.
J. P. Heller.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 1-26, 1972. 11 fig, 1 tab, 14 ref.

Descriptors: *Mixing, *Diffusion, *Porous media, *Groundwater movement, Darcys law, Numerical analysis, Mathematical models, Path of pollutants, Dispersion.

A physical description of the mechanisms of flow and dispersion is based on the interpretation of several observations of flow behavior. Darcy's law leads to a microscopic description of Navier-Stokes flow in which interstitial flow velocity is expressed in terms of the externally imposed flow. Observed flow reversability is not complete, and suggests an influence of diffusion in modifying traveltime distributions. The effects of permeability heterogeneity were also examined, using a numerical model with randomly placed permeability variations, and an effective dispersion coefficient was calculated from it. (See also W74-12811) (Knapp-USGS)
W74-12812

MATRIX PROPERTIES OF POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
R. A. Greenkorn.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 27-57, 1972. 14 fig, 51 ref.

Descriptors: *Porous media, *Groundwater movement, Darcys law, Porosity, Particle size, Permeability, Dispersion, Capillary action, Adsorption, Wettability.

The matrix properties that characterize porous media are reviewed. It is necessary to relate geometric and flow properties to understand mechanisms of flow in porous media. The microscopic pore geometry is described with reference to pore size distributions, particle size distributions, and packing. Mechanical properties which are pertinent are also discussed. The flow properties such as permeability, dispersion, tortuosity, capillary pressure, connectivity, relative permeability, adsorption, and wettability which describe the matrix from the point of view of the fluid are used to describe the matrix. The relation of geometric and flow properties is discussed in terms of phenomenological, statistical, and deterministic models. Finally the media is characterized macroscopically in terms of heterogeneity, nonuniformity, and anistropy. This macroscopic characterization is defined at the level of Darcy's law using the distribution of permeability of porous media. (See also W74-12811) (Knapp-USGS)
W74-12813

PORE STRUCTURE AND FLOW PROPERTIES OF POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
F. A. L. Dullien.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 58-73, 1972. 6 fig, 30 ref.

Descriptors: *Porous media, *Porosity, *Pores, *Rock properties, Groundwater movement, Permeability, Hydraulic conductivity, Flow.

The pore structure of many porous media consists of a three-dimensional array of voids which are separated from each other by narrower throats. A mercury porosimetry curve gives the distribution of the controlling throat sizes in the sample. Photomicrographic methods, based on the principles of quantitative stereology, determine the distribution of void sizes in a sample. The mercury porosimetry and photomicrographic distribution curves together provide a great deal more insight into the pore structure of a sample than either of them can provide by itself. Both curves were determined for a number of sandstones and some unconsolidated packs of particles. The two curves differed from each other drastically in every case. The difference between the curves may be used to measure the magnitude of the sequential variations in the cross section of the flow channels. Residual oil saturations found in laboratory oil recovery tests were successfully correlated for all the samples in terms of a parameter constructed from the two curves. Flow rate-pressure gradient experiments demonstrate that calculated permeabilities which neglect kinetic energy losses due to constrictions and expansions of flow channels may be too high by a factor of five or more. (See also W74-12811) (Knapp-USGS)
W74-12814

COMPUTER ANALYSIS OF THE PORE STRUCTURE OF ISOTROPIC POROUS MEDIA,
Agricultural Research Service, Saint Paul, Minn. Soil and Water Conservation Research Div.
D. A. Farrell, and W. E. Larson.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 74-87, 1972. 6 fig, 13 ref.

Descriptors: *Porous media, *Flow, *Groundwater movement, Porosity, Model studies, Mathematical models, Hydraulic conductivity, Permeability.

Fluid flow through a two-dimensional network model of the pore structure of a porous medium was analyzed by a high-speed digital computer. The effect of network size or number of pore domains on the computed conductivity increased as the heterogeneity of the porous medium increased. The effect of the ratio of domain size to mesh size on conducitvity increased slightly with network size and with increasing heterogeneity. The relative potential gradients for the different domains in the two-dimensional model were substantially affected both by network size and by the heterogeneity of the medium. Interdomain tortuosity seemed to be a minor factor and was only weakly dependent on network size. The computer conductivities and computed relationships between pore size and relative potential gradient were consistent with the predictions of a recently proposed conductance model of pore structure. Current pore models assume an invariant relationship between the relative potential gradient and the pores corresponding to a specific level of saturation. Using this assumption, results of this analysis suggest that conductivity predictions for heterogeneous media may be adversely affected. (See also W74-12811) (Knapp-USGS)
W74-12815

SIMILITUDE REQUIREMENTS FOR MOISTURE FLOW THROUGH THE POROUS MATERIALS,
Lund Inst. of Tech. (Sweden). Dept. of Building Technology.
For primary bibliographic entry see Field 2G.
W74-12816

THE FIELD STUDY OF SAND MOTION THROUGH POROUS MEDIUM BY MEANS OF LUMINOPHORS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Baku (USSR).
For primary bibliographic entry see Field 2J.
W74-12817

TWO- AND THREE-POINT MODELS OF THE SOIL MOISTURE CHARACTERISTIC AND HYDRAULIC CONDUCTIVITY FOR FIELD USE,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2G.
W74-12819

EVALUATION OF CAPILLARY PROPERTIES OF CAPROCKS,
Wyoming Univ., Laramie. Dept. of Petroleum Engineering.
M. A. Ibrahim, and D. L. Katz.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 137-154, 1972. 5 fig, 1 tab, 12 ref.

Descriptors: *Aquicludes, *Capillary conductivity, *Oil reservoirs, Hydraulic conductivity, Groundwater movement.
Identifiers: Caprocks(Oil reservoirs).

Methods are given for measuring capillary forces in caprocks of underground hydrocarbon reservoirs. Analysis of earth pressure gradients in such reservoirs is discussed with special reference to the presence of 'Delta Pressures.' Capillary theory as applied to caprocks is reviewed. The applicable and suggested methods of evaluation of capillary

properties are: (a) restored state method by gas-water or oil-water displacement, (b) mercury intrusion, (c) nitrogen adsorption, and (d) water vapor pressure. The possibilities of improving the measuring techniques and interpretation of results are discussed. (See also W74-12811) (Knapp-USGS)
W74-12820

JUMP CONDITIONS IN THE HYDRODYNAMICS OF POROUS MEDIA,
Agricultural Research Service, Madison, Wis. Soil and Water Conservation Research Div.
P. A. C. Raats.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 155-173, 1972. 3 fig, 28 ref.

Descriptors: *Porous media, *Groundwater movement, *Soil water movement, Infiltration, Percolation, Hydraulic conductivity, Interfaces, Boundary processes, Flow, Unsaturated flow.

Boundary conditions for a fluid flowing in a rigid porous medium are formulated on the basis of a mechanical continuum theory of mixtures. For isotropic, saturated media, the traditional boundary condition of continuity of the normal component of the flux is correct, and deviations from the traditional assumption that the pressure head is continuous are confined to very small distances from a boundary. On the basis of the traditional boundary conditions, at an interface between two unsaturated porous media whose hydraulic conductivity/pressure head curves intersect each other, the refraction of the streamlines may be away from the normal to the interface, absent, or towards the normal to the interface. Again using the traditional boundary conditions, the refraction of equipotentials and streamlines at an interface between anisotropic porous media is analyzed in detail. In particular, the direction along which there is no refraction is determined. The boundary condition for the pressure head is generalized to include a finite surface resistance. (See also W74-12811) (Knapp-USGS)
W74-12821

MATHEMATICAL FORMULATION OF TRANSPORT PHENOMENA IN POROUS MEDIA,
Hebrew Univ., Jerusalem (Israel). Dept. of Hydrology.
Y. Bachmat, and J. Bear.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 174-193, 1972. 4 ref.

Descriptors: *Soil water movement, *Groundwater movement, *Mathematical studies, Saturated flow, Unsaturated flow, Mass transfer, Convection, Energy transfer, Diffusion, Dispersion, Thermodynamics.

A mathematical formulation describes transport phenomena in porous media. A general definition is presented of a porous medium as a special type of a heterogeneous medium, without reference to any particular medium geometry. The microscopic and macroscopic levels of description of fields and their variations in a porous medium domain are discussed and the rules of passage from one level to the other are stated. Generalized macroscopic balance equations of any extensive quantity are developed and applied to the momentum, volume, mass and energy of a phase and to the mass of a component of it. These equations include terms describing transport by convection, dispersion, molecular diffusion and interphase transfer. A general formulation of boundary conditions is presented and applied to fields involving the transfer of entities for which balance equations were derived. (See also W74-12811) (Knapp-USGS)
W74-12822

LIMITS OF DETERMINISTIC PREDICTABILITY OF SATURATED FLOW EQUATIONS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
B. Sagar, and C. C. Kisiel.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ., Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 194-205, 1972. 4 fig, 12 ref.

Descriptors: *Saturated flow, *Equations, *Numerical analysis, Flow, Porous media, Groundwater movement, Mathematical models.
Identifiers: Error analysis.

The effect of uncertainties and lumping of parameters in the deterministic saturated flow equations on the predictability of these equations is discussed. With a simple example, it is shown that in a dynamic system with initial errors in the parameters the error in the predicted values grows with time. In this manner, the existence of an upper limit on the time up to which the partial differential equation can be used for prediction is sought. Such error studies appear necessary in the face of the data collection problem under real-world conditions. (See also W74-12811) (Knapp-USGS)
W74-12823

SUMMARY OF LATEST WORKS ON UNSTEADY FLOW OF LIQUIDS THROUGH POROUS MEDIA,
Institut Neftekhimicheskoi i Gazovoi Promyshlennosti, Moscow (USSR).
V. N. Shchelkachev.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 206-221, 1972. 25 ref.

Descriptors: *Unsteady flow, *Porous media, Saturated flow, Unsaturated flow, Drawdown, Equations, Hydrodynamics, Groundwater movement, Soil water movement.

Calculations connected with investigation of oil and water exploitation often consider plane-radial flows. Recent work in the USSR devoted to investigations of unsteady one-dimensional flows is reviewed. Special attention is paid to tabulated special functions, yielding simple calculation formulae for basic unsteady plane-radial flows. A very general single formula for calculations of all the three simplest types of unsteady one-dimensional flows is deduced. (See also W74-12811) (Knapp-USGS)
W74-12824

ANALYTICAL THEORY OF WATER MOVEMENT IN SOILS,
Connnecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 2G.
W74-12825

GENERALIZATION OF DARCY LAW FOR RHEOLOGICALLY COMPLEX LIQUIDS AND ERROR ESTIMATION OF CALCULATIONS BASED ON DARCY LINEAR APPROXIMATION,
Severnyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Leningrad (USSR).
For primary bibliographic entry see Field 2G.
W74-12826

THE NUMERICAL ANALYSIS OF FLOW IN HETEROGENEOUS POROUS MEDIA,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W74-12828

HYDRAULIC CONDUCTIVITY OF WATER-RESISTANT PROTECTIONS OF CLAYEY SOILS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR).
For primary bibliographic entry see Field 2G.
W74-12829

FLOW OF WATER THROUGH POROUS MEDIA AT LOW SHEAR RATES,
New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.
C. R. Dudgeon.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 279-291, 1972. 3 fig, 4 ref.

Descriptors: *Darcys law, *Flow, *Porous media, Groundwater movement, Soil water movement, Aqueous solutions, Stress, Strain, Hydraulic conductivity.

Non-Darcy flow behavior in groundwater movement and theoretical arguments used to justify non-Darcy flow at low shear rates and their applicability to the flow of water through relatively coarse, clay-free granular media and capillary tubes are reviewed. In experiments using a capillary tube, water appeared to behave as a thixotropic non-Newtonian fluid at low shear rates. It is suggested that changes in the nature and concentration of ions in solution during the course of experiments or in natural groundwater flow may significantly affect the stress-strain characteristics of water and thus its response to applied hydraulic gradients. (See also W74-12811) (Knapp-USGS)
W74-12830

FLOW OF WATER IN SWELLING SOIL,
Research Inst. for Land Reclamation and Improvement, Zbraslav (Czechoslovakia).
For primary bibliographic entry see Field 2G.
W74-12831

UNSATURATED FLOW IN EXPANSIVE SOILS,
McGill Univ., Montreal (Quebec). Soil Mechanics Lab.
For primary bibliographic entry see Field 2G.
W74-12832

EFFECTS OF AIR PRESSURE DURING WATER FLOW IN AN UNSATURATED, STRATIFIED VERTICAL COLUMN OF SOIL,
Grenoble Univ. (France). Laboratoires de Mecanique des Fluides.
For primary bibliographic entry see Field 2G.
W74-12833

IMBIBITION IN FLOW OF TWO IMMISCIBLE LIQUIDS THROUGH A CRACKED POROUS MEDIUM WITH SMALL VISCOSITY DIFFERENCE,
J. V. Regional Coll. of Engineering and Technology, Surat (India). Dept. of Applied Mathematics.
A. P. Verma.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ., Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 393-402, 1972. 2 fig, 17 ref.

Descriptors: *Porous media, *Saturated flow, *Unsaturated flow, Groundwater movement, Wettability, Wetting.
Identifiers: *Imbibition, *Multiphase flow.

A mathematical description is given of the imbibition phenomenon in displacement problems involving two liquid phases and an inhomogeneous porous media. Imbibition depends essentially upon the relative wetting ability of the fluids with respect to the porous medium. Such problems have gained considerable importance particularly in petroleum technology and hydrogeology. The basic assumptions underlying the study are that the viscosity difference between the resident and invading liquids is small, the invading liquid is a preferentially wetting phase, and the inhomogeneity in the media is due to the presence of a well developed system of randomly oriented fissures. A nonlinear differential equation was formulated and its approximate mathematical solution under appropriate boundary conditions was obtained. (See also W74-12811) (Knapp-USGS)
W74-12834

UNSATURATED FLOW OF WATER IN ANISOTROPIC POROUS MEDIA,
National Council for Scientific Research, Lusaka (Zambia).
For primary bibliographic entry see Field 2G.
W74-12835

STEADY STATE POTENTIAL PROFILES IN LAYERED POROUS MATERIALS,
Iranian Plan and Budget Organization, Tehran. Technical Bureau.
M. Bybordi.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 413-424, 1972. 4 fig, 10 ref.

Descriptors: *Infiltration, *Unsaturated flow, *Anisotropy, Moisture content, Moisture tension, Soil water movement, Profiles, Potential flow.

The shape of steady-state potential profiles in a layered porous material was examined both theoretically and experimentally. A variety of shapes are possible, depending on the rate of flow and the hydrologic properties of the layers. In arid zones, sprinkler irrigation or rainfall usually supplies water at rates too low for ponded water to be maintained on the soil surface. Infiltration under these conditions requires a knowledge of the dependence of the hydraulic conductivity and the pore water suction or pressure of a porous material upon the degree of saturation, in order to apply Darcy's law to the calculation of the potential profiles in a variety of situations, especially those of layered porous materials. (See also W74-12811) (Knapp-USGS)
W74-12836

A VERSATILE SOIL WATER FLUX METER,
Agricultural Research Service, Madison, Wis. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 2G.
W74-12837

DYNAMIC MEASUREMENT OF HYDROLOGIC PROPERTIES OF A LAYERED SOIL DURING DRAINAGE AND EVAPORATION, FOLLOWED BY WETTING,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-12838

FLOW LAWS FOR PSEUDOPLASTIC INJECTION FLUIDS (CLAY SUSPENSIONS) IN GRAVEL,
Karlsruhe Univ (West Germany). Institut fuer Bodenmechanik und Felsmechanik.
K. Gelbert, and A. Blinde.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 461-481, 1972. 6 fig, 1 tab, 5 ref.

Descriptors: *Rheology, *Suspension, *Clays, *Grouting, Permeability, Plasticity, Viscosity, Porous media, *Gravels.

In grouting, viscous materials are injected into the subsoil in order to improve the impermeability and stability. The penetration of an injection is dependent on the stagnation gradient, and the rate of grouting is a function of the permeability. A conceptual pore canal model is based on an assembly of spheres, the pore size distribution of which is determined in analogy to the known grain size distributions of natural porous systems. The model system derived from this is composed of a combination of tubes with varying diameters. Results of model calculations were compared with results of pumping clay suspensions through gravels. For the highest discharge velocity used, flow is laminar in the pore system. The assumption that permeability is constant with respect to flow rate, especially for relatively high discharge velocities is approximately valid. The errors involved lie in the order of a factor of ten which is no greater than other errors commonly associated with subsoil hydraulics. (See also W74-12811) (Knapp-USGS)
W74-12839

FILTER PROCESSES IN RIVER BEDS,
Karlsruhe Univ. (West Germany).
For primary bibliographic entry see Field 2A.
W74-12840

THE COMBINED STUDY OF SEEPAGE PROPERTIES OF SEMIPERMEABLE SOILS FOR ESTIMATING INTERRELATIONSHIP OF AQUIFERS,
Moscow State Univ. (USSR). Surface and Ground Waters Interrelationship Lab.
S. M. Semenova-Erofeeva, G. M. Berezkina, and I. A. Briling.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 495-513, 1972. 4 fig, 4 tab, 24 ref.

Descriptors: *Clays, *Aquicludes, *Aquitards, *Artesian aquifers, Hydrogeology, Aquifer characteristics, Permeability, Analytical techniques, Geochemistry, Groundwater movement, Seepage.

Studies of water transport in clay rocks are important in solving a number of regional hydrogeological problems. Combined field investigations give an average characterization of the permeability of confining clay interlayers through which leakage occurs between aquifers. Laboratory methods reveal the mechanisms of transport and separate its components into hydraulic, osmotic and diffusion flows, and explain abnormalities depending on the mineralogical composition, the degree of dispersity, density, temperature, and hydrochemical conditions. Application of electron microscopy and X-ray analysis makes it possible to explain these abnormalities from the viewpoint of structural and textural changes in clay rocks subjected to hydraulic flow. Combined experimental and field work establishes the general calculation pattern to estimate properly the permeability and interrelationship of aquifers. (See also W74-12811) (Knapp-USGS)
W74-12841

USING POTENTIAL FLOW THEORY TO DETERMINE SOIL MOISTURE DISTRIBUTION ABOUT AN ISOLATED TREE,
Northern Forest Research Center, Edmonton (Alberta).
For primary bibliographic entry see Field 2G.
W74-12842

HYDRODYNAMIC REGIMES OF SUBSURFACE RETURN FLOW,
Howard Univ., Washington, D.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W74-12843

VARIATION OF GROUND WATER DISCHARGE ZONE AS A FUNCTION OF INFILTRATION RATE,
Tehran Polytechnic (Iran). Civil Engineering Inst.
M. Shahbazi.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 536-555, 1972. 11 fig, 7 ref.

Descriptors: *Groundwater movement, *Infiltration, *Discharge(Water), *Mathematical models, Groundwater basins, Water balance.

The variation of the discharge zone as a function of infiltration rate was studied in a two-dimensional mathematical model of a steady state, homogeneous, isotropic groundwater basin. The geometry of the zones of recharge and discharge is a function of ground surface profile, variation in rate of recharge, hydraulic conductivity of porous media, and the geometry of the flow domain. The model consists of two derived series of harmonic functions, one determining the shape of groundwater table and the other expressing the continuity equation between recharge and discharge. With an increase in the ratio between rate of recharge and hydraulic conductivity of the media, the point between recharge and discharge moves towards the mid-point between valley bottom and water divide. With other parameters constant, the steeper the ground surface slope the more concentrated is the flow in the discharge zone. (See also W74-12811) (Knapp-USGS)
W74-12844

TRANSPORT PHENOMENA CONTROLLING EVAPORATION FROM SOIL,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 2D.
W74-12845

EFFECT OF SOIL SALINITY ON THE RATE OF EVAPORATION,
Baghdad Univ. (Iraq). Coll. of Agriculture.
For primary bibliographic entry see Field 2G.
W74-12846

MODEL RESEARCH INTO THE SPEED AND HEIGHT OF CAPILLARY INFILTRATION IN SOME SOILS WITH TWO LEVELS OF MOISTURE,
Szkola Glowna Gosodarstwa Wiejskiego, Warsaw (Poland). Inst. of Crop Production.
For primary bibliographic entry see Field 2G.
W74-12847

COUPLING BETWEEN TRANSPORT PROCESSES IN POROUS MEDIA,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science.
G. H. Bolt, and P. H. Groenevelt.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous

Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 630-652, 1972. 3 tab, 4 ref.

Descriptors: *Porous media, *Membrane processes, *Mass transfer, *Ion transport, Diffusion, Osmosis, Flow, Groundwater movement, Thermodynamics.

Several sets of fluxes may be chosen to describe the transport processes occurring in porous media. Depending on the chosen set, the degree of coupling between fluxes will differ. Examples are given of coupling coefficients based on permiselective properties of the matrix. (See also W74-12811) (Knapp-USGS)
W74-12848

COUPLING BETWEEN TRANSPORT PROCESSES IN AN ANISOTROPIC MIXTURE OF FLUIDS AND SOLID PARTICLES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 2J.
W74-12849

PHYSICO-CHEMICAL AND MICROBIAL REACTION EFFECTS ON TRANSPORT IN POROUS MEDIA,
Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 5B.
W74-12850

RELATIONSHIP BETWEEN THE HYDROLOGY, FLUID CHEMISTRY AND DIAGENETIC MINERAL FORMATION IN THE COASTAL AREAS OF THE PERSIAN GULF,
Ontario Water Resources Commission, Ottawa.
For primary bibliographic entry see Field 2L.
W74-12851

THE INFLUENCE OF WATER TRANSPORT AND TRANSFER OF HEAT BY FREEZING AND DEFROSTING ON SOIL GENESIS,
Akademiya Nauk SSSR, Moscow. Institut Agrokhimii i Pochvovedeniya.
For primary bibliographic entry see Field 2G.
W74-12852

EFFECT OF MICROBIOLOGICAL PROCESSES ON PERCOLATION OF WATER THROUGH SOIL,
Gruzinskii Nauchno-Issledovateslkii Institut Gidrotekhniki i Melioratsii, Tiflis (USSR).
For primary bibliographic entry see Field 2G.
W74-12853

SOME RECENT APPLICATIONS OF THE THEORY OF DISPERSION IN POROUS MEDIA,
Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information.
J. J. Fried.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 722-731, 1972. 2 fig, 15 ref.

Descriptors: *Dispersion, *Porous media, Path of pollutants, Groundwater movement, Equations, Waste disposal wells.

Some practical results about the behavior of the classical dispersion equation in field applications and its validity as a mathematical model of dispersion are discussed. Methods used to collect in-situ dispersion coefficients are surveyed. The general diffusion equation is not the perfect dispersion model, but its accuracy is sufficient for most practical problems. It is necessary to make in-situ experiments to collect longitudinal dispersion coefficients as laboratory results completely differ from field values. Change of scale is not yet solved. A set of experiments should be derived at each scale of dispersion. (See also W74-12811) (Knapp-USGS)
W74-12854

SOLUTE TRANSPORT IN AGGREGATED SOILS: TRACER ZONE SHAPE IN RELATION TO PORE-VELOCITY DISTRIBUTION AND ADSORPTION,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 5B.
W74-12855

A NEW METHOD FOR DETERMINING AND INTERPRETING DISPERSION COEFFICIENTS IN POROUS MEDIA,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
D. W. Lawson, and D. E. Elrick.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 753-777, 1972. 16 fig, 11 ref.

Descriptors: *Dispersion, *Tracers, *Porous media, *Groundwater movement, *Soil water movement, Tracking techniques, Sampling, Instrumentation, Diffusion, Mixing.

A tracer method for determining longitudinal and transverse dispersion coefficients in the field was investigated under laboratory conditions using a glass bead medium. For the ideal case of perfect two-dimensional dispersion in a homogeneous isotropic medium, the density and viscosity along a vertical line through a horizontally dispersed tracer solution should be constant. Considering the natural variability of earth materials, a curve-matching technique is of sufficient accuracy for practical field applications. The precision of the method is such that comparative studies of the longitudinal and transverse dispersion coefficients of different porous media can be undertaken. Field applications will always suffer from the physical difficulties inherent in providing the instantaneous line source; in locating a natural, uniform, two-dimensional velocity field; and from the necessity of locating the downstream sampling point on the same streamline as the injection point. Care must be taken to avoid hydrodynamic instabilities. (See also W74-12811) (Knapp-USGS)
W74-12856

COMPARISON OF DISPERSION CHARACTERISTICS IN FISSURED ROCK,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-12857

FINITE ELEMENT ANALYSIS OF THREE-DIMENSIONAL GROUNDWATER FLOW PROBLEMS,
University of Wales Inst. of Science and Tech., Cardiff. Dept. of Civil Engineering and Building Technology.
P. W. France.
Journal of Hydrology, Vol 21, No 4, p 381-398, 1974. 14 fig, 12 ref.

Descriptors: *Groundwater, *Aquifers, *Groundwater movement, Digital computers, *Numerical analysis, *Finite element analysis, Permeability, Mathematical models, Equations, Steady flow, Unsteady flow.
Identifiers: Finite difference method, *Three-dimensional flow, Fluid flow systems, Galerkins method.

A numerical method was presented for analysing either steady state or transient three-dimensional groundwater flow problems. The governing equation was formulated in terms of the finite element process using the Galerkin approach, and cubic isoparametric elements were used to simulate the flow domain as these permit accurate modelling of curved boundaries. Particular attention was paid to the time dependent movement of the phreatic surface where an iterative technique based on the replacement of the original transient problem by a discrete number of steady state problems was used to effect a solution. Furthermore, in tracing the movement of the surface, use was made of the element formulation theory in order to compute the normal to the boundary. The validity of the technique was first established by analysing a radially symmetrical problem for which an alternative analytical solution was available. Finally, a general three-dimensional flow system was studied for which there is no known analytical solution. Relatively few elements were required to yield practical solutions. (Schicht-ISWS)
W74-12984

GROWTH AND DECAY OF GROUNDWATER MOUNDS INDUCED BY PERCOLATION,
California Univ., Davis.
M. A. Marino.
Journal of Hydrology, Vol 22, No 3-4, p 295-301, 1974. 1 fig, 9 ref, append.

Descriptors: *Water table aquifers, *Deep percolation, *Mathematical studies, Groundwater, Water table, Aquifers, Analytical techniques, Laplaces Equation, Hydraulic conductivity, Groundwater movement.
Identifiers: *Groundwater mounds, Analytic solutions.

Analytical expressions were derived which described the growth and decay of groundwater mounds in an unconfined aquifer receiving uniform vertical percolation. The solutions were expressed in terms of the head averaged over the depth of saturation and were applicable when the water table rise was smaller than 50% of the initial depth of saturation. The aquifer was homogeneous, isotropic, resting on a horizontal impermeable base, and discharging into a surface reservoir in which the water level remained equal to that of the main flow before the incidence of percolation. The rate of percolation was maintained by a spreading area in the form of an infinitely long strip, but of finite width, located above the aquifer. The rate of percolation relative to the hydraulic conductivity was consider so small that the vertically downward percolation was almost completely refracted in the direction of the slope of the water table. (Visocky-ISWS)
W74-12987

ATOLL PERMEABILITY CALCULATED FROM TIDAL DIFFUSION,
Scripps Institution of Oceanography, La Jolla, Calif.
R. K. Lam.
Journal of Geophysical Research, Vol 79, No 21, p 3073-3081, July 20, 1974. 12 fig, 12 ref. NOAA-2-35208.

Descriptors: *Atolls, *Islands, *Lagoons, *Groundwater, *Permeability, Diffusion, Tides, Diurnal, Tidal effects, Tidal waters, Homogeneity, Mathematical models, Water wells, Water level fluctuations, Aquifer characteristics, Oceans.
Identifiers: *Swains Island, *Tokelau group, Numerical models, Pressure field, Model comparisons.

A method was presented for calculating the average subsurface permeability of an atoll from surface measurements of groundwater tides. Tide measurements of about 1-month duration were taken on Swains Island, an atoll located in the southern Tokelau group. Records were obtained

for the ocean, the lagoon, and eight wells on land. These measurements were compared with numerical models to predict subsurface permeability. The complex nature of the data necessitated the use of models with complicated but realistic surface boundary conditions. Tide amplitude comparisons predicted a mean permeability of 0.0000044 sq cm, whereas phase considerations led to a prediction of 0.0000141 sq cm. Because the set of measurements could be modeled by adjusting surface boundary conditions, it was not possible to investigate the question of inhomogeneity in the interior of Swains Island. (Prickett-ISWS)
W74-12995

SIMULTANEOUS EVALUATION OF DRAWDOWN DATA FROM SEVERAL OBSERVATION WELLS BY MEANS OF A MODIFICATION OF THE WALTON METHOD,
Technische Hogeschool, Delft (Netherlands). Geophysical Lab.
For primary bibliographic entry see Field 4B.
W74-12999

AQUIFER ANALYSIS USING BACKWARD DIFFERENCE METHODS,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-13012

ANOMALOUS TRANSMISSION OF WATER THROUGH CERTAIN PEATS,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
H. A. P. Ingram, D. W. Rycroft, and D. J. A. Williams.
Journal of Hydrology, Vol 22, No 3-4, p 213-218, 1974. 5 fig, 12 ref.

Descriptors: *On-site investigations, *Piezometers, *Hydraulic conductivity, *Peat, Bogs, Darcys law, On-site tests, Testing procedures, Porous media, Groundwater movement.
Identifiers: Humified peat, *Sphagnum, Eriophorum vaginatum, Culluna vulgaris, *United Kingdom(Scotland), Grampian foothills, Perthshire(Scotland).

Field experiments were described in which seepage tubes were used under variable-head and constant-head conditions. The estimates of 'hydraulic conductivity' obtained from humified peat showed time dependence, but they also increased with head, indicating departure from Darcy's law. It is suggested that this law is only obeyed in unhumified peat. (Visocky-ISWS)
W74-13014

HYDROGEOLOGY OF THE POTTSVILLE FORMATION IN NORTHEASTERN OHIO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13015

HYDROLOGY AND WATER RESOURCES OF THE DEERFIELD RIVER BASIN, MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13016

AVAILABILITY OF FRESH GROUND WATER IN NORTHEASTERN WORCESTER COUNTY, MARYLAND: WITH SPECIAL EMPHASIS ON THE OCEAN CITY AREA,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W74-13175

AN EVALUATION OF THE MAGOTHY AQUIFER IN THE ANNAPOLIS AREA, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W74-13176

HYDROGEOLOGIC ASPECTS OF STRUCTURAL DEFORMATION IN THE NORTHERN GULF OF MEXICO BASIN,
Geological Survey, Bay St. Louis, Miss.
P. H. Jones, and R. H. Wallace, Jr.
Journal of Research, US Geological Survey, Vol 2, No 5, p 511-517, September-October, 1974. 13 fig, 13 ref.

Descriptors: Gulf of Mexico, *Hydrogeology, *Structural geology, *Sedimentation, *Gulf Coastal Plain, *Pore pressure, Pore water, Subsidence, Faults(Geologic), Deformation, Continental margin, Continental Shelf, Continental slope, Sedimentary structures.

Resistance of unconsolidated clastic sediments to structural deformation is an inverse function of water content and pore pressure and has no uniform relation to depth of burial in the Gulf of Mexico basin. Deposited rapidly along the northwestern margin of the Gulf Coast geosyncline, younger sediments have buried older ones deeply before they could drain properly in response to compaction stress of overburden load. Contemporaneous gravity faults of major dimension occur along gulfward margins of delta-front sand bodies, reflecting the effect of sediment facies distribution on structure. Sand bodies are more stable than shale masses. Such contemporaneous or growth faults are a most distinctive feature of the geology of the Gulf of Mexico basin; they are normal faults with progressive increase in throw with depth and, across which, from upthrown to downthrown block, correlative section thickens greatly. In plan and profile, faulted masses resemble landslides; fault planes are concave gulfward and upward, the dip decreasing with depth. Fault movement rotates the block, causing reversal of dip of beds in the block and sealing the land ward ends of included aquifers to discharge of waters of compaction. This proves geopressured conditions so common in the Gulf Coastal Plain and Continental Shelf. Early development of geopressure in the block reduces resistance to shear, and progressive landward side loading of the block sustains rotational stress. Geopressured water flowing into the fault zone-the easiest escape route-reduces drag and facilitates movement on the fault. (Knapp-USGS)
W74-13179

REGIONAL FLOW SYSTEM AND GROUNDWATER QUALITY IN WESTERN OHIO,
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 4B.
W74-13181

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF PARTS OF THE MEDXNEKEAG RIVER AND PRESTILE STREAM BASINS, MAINE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13192

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE LOWER ST. JOHN RIVER VALLEY, MAINE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13193

SUMMARY GROUND-WATER RESOURCES OF BEAVER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13200

SUMMARY GROUND-WATER RESOURCES OF WASHINGTON COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13201

SUMMARY GROUND-WATER RESOURCES OF WESTMORELAND COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13202

SUMMARY GROUND-WATER RESOURCES OF BUTLER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13203

SUMMARY GROUND-WATER RESOURCES OF ALLEGHENY COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13204

SUMMARY GROUND-WATER RESOURCES OF ARMSTRONG COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13205

INFLUENCE OF RECHARGE BASINS ON THE HYDROLOGY OF NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-13206

HYDROGEOLOGIC CHARACTERISTICS OF THE SURFICIAL AQUIFER IN NORTHWEST HILLSBOROUGH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
W. C. Sinclair.
Florida Bureau of Geology, Tallahassee, Information Circular No 86, 1974. 98 p, 1 fig, 4 tab, 10 ref.

Descriptors: *Hydrogeology, *Florida, *Artificial recharge, Aquifers, Aquicludes, Aquifer characteristics, Aquifer testing, Water levels, Test wells.
Identifiers: *Hillsborough County(Fla).

To study the feasibility of artificial recharge of the shallow aquifer in Hillsborough County, Florida, 59 holes were augered to the top of the limestone Floridan Aquifer. Lithologic and gamma logs of the holes were used in conjunction with laboratory analyses of samples to define the hydrogeology of the unconsolidated deposits of the surficial aquifer overlying the limestone. The surficial aquifer comprises an upper fine sand unit which averages about 15 feet thick and a lower sequence of sandy clay and clayey sand layers which average about 25 feet thick. Median grain size, specific yield, and vertical permeability of the surficial aquifer decrease downward. The coefficient of vertical permeability of the sand is about 100 gallons per day per square foot, but the coefficient of vertical permeability of the lower sand and clayey sand is much lower, ranging from 0.01 to 0.1 gpd per square foot. A confining layer of dense clay underlies the surficial aquifer, separating it from the Floridan Aquifer. The potentiometric surface in the surficial aquifer stands in average of 10 feet above that in the Floridan. Leakage of about 140,000 gal per day per sq mi from the surficial aquifer to the Floridan occurs through the confining layer as well as through perforations in the confining layer. (Knapp-USGS)
W74-13208

GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W74-13209

FEASIBILITY STUDY FOR DEVELOPMENT OF HOT-WATER GEOTHERMAL SYSTEMS,
California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 4B.
W74-13213

ANNUAL REPORT ON GROUND WATER IN ARIZONA, SPRING 1972 TO SPRING 1973,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W74-13350

2G. Water In Soils

THE WATER RELATIONS OF THE ALGA CYANIDIUM CALDARIUM IN SOIL,
California Univ., Los Angeles. Dept. of Bacteriology.
For primary bibliographic entry see Field 5B.
W74-12777

THE GROWTH OF SELECTED MYCORRHIZAL FUNGI IN RESPONSE TO INDUCED WATER STRESS,
Colo. State Univ, Dep. for and Wood Sci., Fort Collins, Colo. Colorado State Univ., Fort Collins. Dept. of Forest and Wood Science.
For primary bibliographic entry see Field 5B.
W74-12789

FUNDAMENTALS OF TRANSPORT PHENOMENA IN POROUS MEDIA.
International Association for Hydraulic Research, Delft (Netherlands); and International Society of Soil Science, Amsterdam (Netherlands).
For primary bibliographic entry see Field 2F.
W74-12811

SIMILITUDE REQUIREMENTS FOR MOISTURE FLOW THROUGH THE POROUS MATERIALS,
Lund Inst. of Tech. (Sweden). Dept. of Building Technology.
M. Bomberg.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 88-101, 1972. 4 fig, 1 tab, 9 ref.

Descriptors: *Porous media, *Unsaturated flow, Infiltration, Capillary conductivity, Wetting, Soil water movement, Groundwater movement, Permeability, Hydraulic conductivity.

Knowledge of the moisture retention (drying and wetting) and conductivity curves is sufficient to characterize a porous material and its response to any moisture flow. (See also W74-12811) (Knapp-USGS)
W74-12816

TWO- AND THREE-POINT MODELS OF THE SOIL MOISTURE CHARACTERISTIC AND HYDRAULIC CONDUCTIVITY FOR FIELD USE,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
A. S. Rogowski.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 124-136, 1972. 5 fig, 21 ref.

Descriptors: *Soil water movement, *Infiltration, Unsaturated flow, Model studies, Moisture tension, Porous media, Hydraulic conductivity.
Identifiers: *Soil moisture characteristic.

A model is proposed for estimating the soil moisture characteristic and hydraulic conductivity when reliable experimental results are not available. Soil moisture characteristic is estimated from the values of water content and pressure at air entry and at 15 bars, and then used as an input to a simplified pore size interaction model. Sensitivity of the model to the variation of input parameters is explored. Temperature-dependent variation is less than the postulated conductivity limits. Results show that hydraulic conductivity as a function of water content is primarily influenced by the choice of water contents at air entry and at 15 bars, while hydraulic conductivity as a function of pressure is influenced by pressure at air entry and can be estimated from experimental values of pressure at air entry and conductivity at water entry. (See also W74-12811) (Knapp-USGS)
W74-12819

JUMP CONDITIONS IN THE HYDRODYNAMICS OF POROUS MEDIA,
Agricultural Research Service, Madison, Wis. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 2F.
W74-12821

MATHEMATICAL FORMULATION OF TRANSPORT PHENOMENA IN POROUS MEDIA,
Hebrew Univ., Jerusalem (Israel). Dept. of Hydrology.
For primary bibliographic entry see Field 2F.
W74-12822

SUMMARY OF LATEST WORKS ON UNSTEADY FLOW OF LIQUIDS THROUGH POROUS MEDIA,
Institut Neftekhimicheskoi i Gazovoi Promyshlennosti, Moscow (USSR).
For primary bibliographic entry see Field 2F.
W74-12824

ANALYTICAL THEORY OF WATER MOVEMENT IN SOILS,
Connnecticut Agricultural Experiment Station, New Haven.
J-Y. Parlange.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 222-236, 1972. 4 fig, 21 ref.

Descriptors: *Soil water movement, *Equations, *Infiltration, Hydraulic conductivity, Diffusivity, Absorption, Mathematical studies, Unsteady flow.

Approximate but analytic expressions are given for the solution of the time-dependent infiltration equation with arbitrary soil properties. Detailed comparison is made with Philip's series expansion in one-dimension. The usefulness of the method is illustrated by the results of some recent two-dimensional absorption experiments. Singular perturbation techniques are of great value in study of gravity effects in multidimensional problems. Steady infiltration from a semicircular furrow is treated as an example. (See also W74-12811) (Knapp-USGS)
W74-12825

GENERALIZATION OF DARCY LAW FOR RHEOLOGICALLY COMPLEX LIQUIDS AND ERROR ESTIMATION OF CALCULATIONS BASED ON DARCY LINEAR APPROXIMATION,
Severnyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Leningrad (USSR).
N. S. Nerpina, and V. J. Yangarber.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 237-244, 1972. 4 fig, 11 ref.

Descriptors: *Infiltration, *Rheology, *Darcys law, Soil water movement, Groundwater movement, Hydraulic conductivity.

To explain nonlinear infiltration, a dependence is suggested which generalizes Darcy law for the case when the actual hydraulic gradient may be higher or lower than the thereshold. A significant error in calculations based on the Darcy linear law arises when water is moving in soils with the infiltration coefficient in the order of 0.0001 cm per sec and lower. (See also W74-12811) (Knapp-USGS)
W74-12826

A NEW ANALYTICAL TREATMENT FOR THE INFILTRATION PROBLEM,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
In: Proc of 2nd International Symposium of Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 257-265, 1972. 7 ref.

Descriptors: *Infiltration, *Soil water movement, *Unsaturated flow, *Equations, Mathematical studies, Porous media.

The solution to the infiltration problem viewed as a two-phase compressible fluid flow problem can be obtained fairly simply. The technique is applicable, in a modified form, to solve the unsaturated flow equation and the results obtained by this method are similar to those obtained by the perturbation method for small times in the limiting case when air compressibility and resistance to air flow are negligible. (See also W74-12811) (Knapp-USGS)
W74-12827

THE NUMERICAL ANALYSIS OF FLOW IN HETEROGENEOUS POROUS MEDIA,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
F. D. Whisler, and K. K. Watson.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 245-256, 1972. 6 fig, 8 ref.

Descriptors: *Porous media, *Infiltration, *Percolation, *Unsaturated flow, *Numerical analysis, Mathematical models, Heterogeneity, Hydraulic conductivity, Soil water movement.

Ponded infiltration and gravity drainage of heterogeneous porous media were studied using numerical analysis of the flow equations. All media were assumed to exhibit scale heterogeneity, specifically defined in terms of a linear variation of the saturated hydraulic conductivity with depth. The hydrologic characteristics were chosen so that their form validly represented real data. The spatial variation of the hydrologic characteristics was initially defined in terms of the air-entry value or water entry value of the media at the point in question and empirical relationships

between these values and the saturated hydraulic conductivity. The pressure head and water content profiles calculated by these analyses exhibit some unusual shapes due to the nature of the media. These results can aid the interpretation of possible field data where the medium is assumed to be homogeneous when, in fact, it is heterogeneous. (See also W74-12811) (Knapp-USGS)
W74-12828

HYDRAULIC CONDUCTIVITY OF WATER-RESISTANT PROTECTIONS OF CLAYEY SOILS,
Vsesoyuznvi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR).
V. N. Zhilenkov.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 266-278, 1972. 2 tab, 11 ref.

Descriptors: *Clays, *Clay loam, *Soil water movement, *Darcys law, Hydraulic conductivity, Porosity, Unsaturated flow, Saturated flow, Porous media.

Hydraulic conductivity changes in clayey soils with consolidation and the validity of Darcy's law in such soils were investigated. The permeability coefficient is exponentially-dependent upon the porosity coefficient of clayey soils. Better correlation is achieved when the porosity coefficient for the soil at the liquid limit is included in the exponent. Formulae are suggested for calculating the hydraulic conductivity of a nonuniformly consolidated clay layer serving as a water barrier. Darcy's law is valid in clayey soils. (See also W74-12811) (Knapp-USGS)
W74-12829

FLOW OF WATER THROUGH POROUS MEDIA AT LOW SHEAR RATES,
New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-12830

FLOW OF WATER IN SWELLING SOIL,
Research Inst. for Land Reclamation and Improvement, Zbraslav (Czechoslovakia).
F. Dolezal, and M. Kutilek.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972. Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 292-305, 1972. 26 ref.

Descriptors: *Soil water movement, *Expansive soils, Clays, Porosity, Permeability, Fractures(Geologic).

Flow of water in swelling soils was analyzed. Fissure porosity depends upon the moisture and the flow in soil containing fissures. Characteristic moistures are therefore distinguished when the one-dimensional volume change converts into three-dimensional volume change, and when the flow in fissures starts to be turbulent. It is demonstrated that the dependence of the porosity of soil mass upon its moisture is not compatible in unsaturated soil with the dependence of the same porosity upon the effective pressure. (See also W74-12811) (Knapp-USGS)
W74-12831

UNSATURATED FLOW IN EXPANSIVE SOILS,
McGill Univ., Montreal (Quebec). Soil Mechanics Lab.
R. N. Yong, and B. P. Warkentin.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 306-319, 1972. 6 fig, 7 ref.

Descriptors: *Soil water movement, *Unsaturated flow, *Expansive solid, *Diffusion, Equations, Expansive clays, Hydraulic conductivity, Mathematical models.

The soil-water diffusion equation is modified in view of the requirement for correspondence between mathematical and physical models, and also in the light of experimental results on diffusion in partially-saturated soils where volume changes occur. The problem of expansive soils in the context of diffusion requires that a closer examination of the driving potentials specified in the generalized Darcy law be made. The pressure potential can no longer be assumed to be the main driving potential in view of the existence of internal potential gradients which themselves will cause water movement. Thus a certain degree of modification of the mathematical model is required, where volume change or swelling (osmotic) pressure might be accounted for in the diffusion equation. (See also W74-12811) (Knapp-USGS)
W74-12832

EFFECTS OF AIR PRESSURE DURING WATER FLOW IN AN UNSATURATED, STRATIFIED VERTICAL COLUMN OF SOIL,
Grenoble Univ. (France). Laboratoires de Mecanique des Fluides.
G. Vachaud, M. Vauclin, M. Wakil, and D. Khanji.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 357-377, 1972. 10 fig, 1 tab, 17 ref.

Descriptors: *Unsaturated flow, *Atmospheric pressure, *Infiltration, *Soil water movement, Soil physical properties, Soil horizons, Soil profiles, Moisture tension.

The effects of air pressure during constant flux infiltration and during gravity drainage were studied experimentally. Water content was measured by gamma ray attenuation; water pressures were obtained simultaneously at ten different levels in the column using tensiometers connected to pressure transducers. The soil column consisted of three layers: fine sand over coarse sand over fine soil. The wall of the column was provided with a series of adjustable ports in order to allow experiments either with or without lateral air entry. The local soil air pressure can be significantly different from the external atmospheric pressure, for example +50 mbar for rain with an intensity of 3 cm/hr or -15 mbar for gravity drainage. The water flow depends not only on the boundary conditions in terms of water content and water pressure, but also is strongly dependent on air pressure conditions. Air pressure must be taken into account when determining the soil water suction, and flow equations must be written in terms of two-phase immiscible fluid flow. (See also W74-12811) (Knapp-USGS)
W74-12833

IMBIBITION IN FLOW OF TWO IMMISCIBLE LIQUIDS THROUGH A CRACKED POROUS MEDIUM WITH SMALL VISCOSITY DIFFERENCE,
J. V. Regional Coll. of Engineering and Technology, Surat (India). Dept. of Applied Mathematics.
For primary bibliographic entry see Field 2F.
W74-12834

UNSATURATED FLOW OF WATER IN ANISOTROPIC POROUS MEDIA,
National Council for Scientific Research, Lusaka (Zambia).
J. Cisler.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 403-412, 1972. 12 ref.

Descriptors: *Unsaturated flow, *Porous media, *Anisotropy, *Hydraulic conductivity, Soil water movement, Moisture content, Permeameters.

The hydraulic conductivity tensor for unsaturated anisotropic porous media has in general nine coefficients and all of them are functions of moisture content or capillary pressure. There is no evidence that the conductivity tensor is symmetric as is that for saturated flow. The conditions necessary for the transformation of the general flow equation into the orthotropic form for the case of two-dimensional gravity and hysteresis-free form are expressed in the terms of directional conductivities. A simple method is proposed to determine experimentally the main and the cross coefficients of the conductivity tensor as functions of capillary pressure. (See also W74-12811) (Knapp-USGS)
W74-12835

STEADY STATE POTENTIAL PROFILES IN LAYERED POROUS MATERIALS,
Iranian Plan and Budget Organization, Tehran. Technical Bureau.
For primary bibliographic entry see Field 2F.
W74-12836

A VERSATILE SOIL WATER FLUX METER,
Agricultural Research Service, Madison, Wis. Soil and Water Conservation Research Div.
C. Dirksen.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 425-442, 1972. 3 fig, 2 tab, 9 ref.

Descriptors: *Soil water movement, *Soil moisture meters, *Flow measurement, Instrumentation, Permeameters, Flow rates, Flowmeters.
Identifiers: Soil water flux meter.

A flux meter was developed to measure soil water fluxes ranging from 0.11 cm/day to 1.43 cm/day. Water is intercepted through a filter plate, fed through a fine metering valve and distributed back into the soil through another filter plate. The setting of the valve is changed until the total hydraulic head loss across the meter is equal to that measured over an equal distance of undisturbed soil nearby. In this way the flux through the meter is made equal to that through the soil, independent of the magnitude of the flux and soil type. This nearly eliminates the need for calibration. The flux through the meter is derived from the measured hydraulic head loss across the valve and a calibration curve which relates the flux per unit hydraulic head loss to the valve setting. This meter can be installed from a direction perpendicular to the direction of flow. This keeps the disturbance of soil and flow field to a minimum. A spring pushes the filter plates against undisturbed soil to minimize contact resistances. This device can also be used as an in-situ hydraulic conductivity meter. (See also W74-12811) (Knapp-USGS)
W74-12837

DYNAMIC MEASUREMENT OF HYDROLOGIC PROPERTIES OF A LAYERED SOIL DURING DRAINAGE AND EVAPORATION, FOLLOWED BY WETTING,
British Columbia Univ., Vancouver. Dept. of Soil Science.
T. L. Chow, and J. de Vries.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario:

International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 443-460, 1972. 6 fig, 1 tab, 42 ref.

Descriptors: *Soil water movement, *Infiltration, *Hysteresis, Moisture content, Hydraulic conductivity, Anisotropy, Evaporation, Wetting.

Soil hydrologic properties for an undisturbed layered soil for the range between -0.1 and -90 bars were inferred from measurements of water content and water potential as functions of time and depth during water flow induced by drainage and evaporation, followed by wetting. No properties showed system dependence. Both water content and hydraulic conductivity showed hysteresis between -0.1 and -3 bars. Water content showed no hysteresis at less than -3 bars, whereas hydraulic conductivity showed inconclusive hysteresis in this range. Hydraulic conductivity displayed hysteresis in the medium water content range, but none at high water contents. Both Darcy's law and the diffusion theory as applied to transient vertical flow of water in an undisturbed layered soil are valid. (See also W74-12811) (Knapp-USGS)
W74-12838

FLOW LAWS FOR PSEUDOPLASTIC INJECTION FLUIDS (CLAY SUSPENSIONS) IN GRAVEL,
Karlsruhe Univ (West Germany). Institut fuer Bodenmechanik und Felsmechanik.
For primary bibliographic entry see Field 2F.
W74-12839

THE COMBINED STUDY OF SEEPAGE PROPERTIES OF SEMIPERMEABLE SOILS FOR ESTIMATING INTERRELATIONSHIP OF AQUIFERS,
Moscow State Univ. (USSR). Surface and Ground Waters Interrelationship Lab.
For primary bibliographic entry see Field 2F.
W74-12841

USING POTENTIAL FLOW THEORY TO DETERMINE SOIL MOISTURE DISTRIBUTION ABOUT AN ISOLATED TREE,
Northern Forest Research Center, Edmonton (Alberta).
G. R. Hillman.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 514-535, 1972. 6 fig, 4 tab, 7 ref.

Descriptors: *Soil water movement, *Trees, *Soil moisture, *Soil-water-plant relationships, Root systems, Model studies, Root zone, Canada, Snowpacks, Infiltration, Water balance.
Identifiers: *Forest hydrology.

A single tree, extracting water from the soil, is assumed to act as a line sink. The tree-soil moisture system is considered to be analogous to a well-groundwater system for which the drawdown pattern is axially symmetric. The study includes conditions ranging from very wet to dry, following a drying cycle. Diagrams showing equipotential lines of soil water determine directions of water movement and locate sources and sinks. Soil water distribution patterns are considerably more complex than hypothesized, and it is inferred that several sources and sinks may exist together in the soil profile in the vicinity of the tree. (See also W74-12811) (Knapp-USGS)
W74-12842

HYDRODYNAMIC REGIMES OF SUBSURFACE RETURN FLOW,
Howard Univ., Washington, D.C. Dept. of Civil Engineering.
C. L. Yen.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 556-565, 1972. 4 fig, 3 tab, 5 ref.

Descriptors: *Return flow, *Infiltration, *Percolation, *Anisotropy, *Soil water movement, Mathematical models, Numerical analysis, Recession curves, Subsurface runoff, Base flow.

Recession hydrographs of quick return flow from highly permeable top soil were obtained by solving linearized equations of motion and continuity. The results indicate the existence of different flow regimes, each identifiable with a hydrodynamically distinct zone of soil. When conditions are such that the governing equations cannot be linearized, numerical solution indicates that an additional regime appears at the beginning of a recession hydrograph. The recession coefficients for various regimes, with interlayer percolation, differ appreciably from those without interlayer percolation. (See also W74-12811) (Knapp-USGS)
W74-12843

VARIATION OF GROUND WATER DISCHARGE ZONE AS A FUNCTION OF INFILTRATION RATE,
Tehran Polytechnic (Iran). Civil Engineering Inst.
For primary bibliographic entry see Field 2F.
W74-12844

TRANSPORT PHENOMENA CONTROLLING EVAPORATION FROM SOIL,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 2D.
W74-12845

EFFECT OF SOIL SALINITY ON THE RATE OF EVAPORATION,
Baghdad Univ. (Iraq). Coll. of Agriculture.
A. Hardan, and A. N. Al-Ani.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 574-581, 1972. 2 fig, 1 tab, 10 ref.

Descriptors: *Evaporation, *Soil moisture, *Salinity, Sulfates, Chlorides, Bicarbonates, Sodium, Calcium, Moisture content, Soil chemical properties.
Identifiers: *Soil salinity.

Salinization of bare soil from a shallow-saline water table was simulated under greenhouse conditions. Constant concentrations of single salts and mixtures of constant Ca:Mg:Na ratio with various Cl:SO4 ratios were used to maintain a constant water table in undisturbed nonsaline columns. The rate of evaporation decreased as the concentration of salts at soil surface increased. The decrease in evaporation rate for single salt treatments was in the order NaHCO3 greater than Na2SO4 greater than NaCl greater than CaCl2, up to an Ece of 5 mmhos/cm. Between ECe values of 6 to 14 mmhos/cm, the order of decreased evaporation rate was NaCl greater than Na2SO4 greater than CaCl2. Water content of the surface soil at the termnation of the experiment was in the order NaHCO3 less than Na2SO4 less than sulfates less than NaCl less than chlorides less than CaCl2. (See also W74-12811) (Knapp-USGS)
W74-12846

MODEL RESEARCH INTO THE SPEED AND HEIGHT OF CAPILLARY INFILTRATION IN SOME SOILS WITH TWO LEVELS OF MOISTURE,
Szkola Glowna Gosodarstwa Wiejskiego, Warsaw (Poland). Inst. of Crop Production.
S. Trzecki.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 582-592, 1972. 12 fig, 2 tab, 9 ref.

Descriptors: *Infiltration, *Antecedent moisture content, *Soil structure, Capillary conductivity, Capillary action.

Capillary infiltration, its height, speed, and amount of infiltrated water were studied for 4 soil structures at 2 levels of moisture content. One of the most important factors influencing the speed and depth of infiltration is capillary diameter, which depends on the mechanical composition of the soil and its bulk density. Infiltration also depends on the temperature of the soil and its moisture. (See also W74-12811) (Knapp-USGS)
W74-12847

COUPLING BETWEEN TRANSPORT PROCESSES IN POROUS MEDIA,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science.
For primary bibliographic entry see Field 2F.
W74-12848

PHYSICO-CHEMICAL AND MICROBIAL REACTION EFFECTS ON TRANSPORT IN POROUS MEDIA,
Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 5B.
W74-12850

THE INFLUENCE OF WATER TRANSPORT AND TRANSFER OF HEAT BY FREEZING AND DEFROSTING ON SOIL GENESIS,
Akademiya Nauk SSSR, Moscow. Institut Agrokhimii i Pochvovedeniya.
O. V. Makeev, and V. I. Dugarov.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 699-712, 1972. 6 fig, 7 ref.

Descriptors: *Frost, *Frozen soils, *Soil water movement, Freezing, Thawing, Mass transfer, Heat transfer, Soil formation.
Identifiers: *USSR(Siberia).

Soil cryogenesis is the whole complex of processes which take place in soil at low temperatures. The main cryogenic processes include migration of moisture and transfer of heat by freezing and thawing. These processes are illustrated in soils of East Siberia. (See also W74-12811) (Knapp-USGS)
W74-12852

EFFECT OF MICROBIOLOGICAL PROCESSES ON PERCOLATION OF WATER THROUGH SOIL,
Gruzinskii Nauchno-Issledovateslkii Institut Gidrotekhniki i Melioratsii, Tiflis (USSR).
Ts. E. Mirtskhulava, G. B. Abelishvili, and M. N. Terletskaya.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 713-721, 1972. 7 ref.

Descriptors: *Soil water movement, *Biochemistry, *Soil formation, Permeability, Soil management, Soil dispersants, Soil conservation, Microbiology.
Identifiers: Gley soils.

The microbiological processes taking place in soil influence its hydrologic properties. The activities of anaerobes cause chemical reduction processes which result in gleization of soils accompanied by increase of dispersion and plasticity and decrease of their permeability. Artificial gleization of soil is induced by means of a screen made of some vegetable substance; this substance is spread as a layer over the area where gleization is desired, and superimposed with another layer of ordinary earth for protection. As this screen is saturated with water, the anaerobes present in the vegetable screen and responsible for soil gleization begin to develop, and the gleization process proliferates deeper and deeper into the underlying soils in the direction of flow. (See also W74-12811) (Knapp-USGS)
W74-12853

SOLUTE TRANSPORT IN AGGREGATED SOILS: TRACER ZONE SHAPE IN RELATION TO PORE-VELOCITY DISTRIBUTION AND ADSORPTION,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 5B.
W74-12855

A NEW METHOD FOR DETERMINING AND INTERPRETING DISPERSION COEFFICIENTS IN POROUS MEDIA,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 2F.
W74-12856

CALCIUM CARBONATE EQUILIBRIA IN SOILS AND IN IRRIGATION WATERS,
New Mexico State Univ., Las Cruces. Dept. of Agronomy.
G. A. O'Connor.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 281, $3.25 in paper copy, $2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report 041, July 1974. 21 p, 4 fig, 2 tab, 19 ref. OWRT A-048-NMEX(1).

Descriptors: *Calcium carbonate, *Aqueous solutions, *Equilibrium, Chemical properties, Thermodynamic behavior, *Soils, Ions, *Model studies.
Identifiers: *Irrigation water degradation, *Ion pairs, Activity coefficients, Kisp values.

Irrigation water degradation is of the utmost interest to water and soil scientists yet meaningful and accurate equations to describe the equilibria of one of the most important solid phases controlling water quality, calcium carbonate, are lacking. The objectives of this research were to: (1) develop a model capable of describing carbonate equilibria in aqueous systems open to the air, and (2) test the model against data for aqueous and soil-water systems. A chemical model was developed that adequately described calcite equilibria over a range of ionic environments that have practical significance to water and soil scientists. The model includes equations to account for activity coefficient and ion-pair effects, and was verified utilizing data from the literature for aqueous systems open to the air. (Hain-New Mexico State)
W74-12862

THE SOIL AS A PHYSICAL FILTER,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 5D.
W74-12872

THE SOIL AS A CHEMICAL FILTER,
Michigan State Univ., Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5D.
W74-12873

THE SOIL AS A BIOLOGICAL FILTER,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-12874

RENOVATING SECONDARY EFFLUENT BY GROUNDWATER RECHARGE WITH INFILTRATION BASINS,
Agriculture Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W74-12877

EFFECTS OF LAND DISPOSAL OF WASTEWATERS ON SOIL PHOSPHORUS RELATIONS,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-12880

EFFECTS OF LAND DISPOSAL OF WASTEWATER ON EXCHANGEABLE CATIONS AND OTHER CHEMICAL ELEMENTS IN THE SOIL,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-12881

FACTORS AFFECTING NITRIFICATION-DENITRIFICATION IN SOILS,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5D.
W74-12882

BIOTOXIC ELEMENTS IN SOILS,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-12883

MICROBIAL HAZARDS IN DISPOSING OF WASTEWATER ON SOIL,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-12884

EFFECT OF FLOODING AND CROPPING ON THE CHANGES IN THE INORGANIC PHOSPHATE FRACTIONS IN SOME RICE SOILS,
University of Agricultural Sciences, Mandya (India). Regional Research Station.
M. A. Singlachar, and R. Samaniego.
Plant Soil. Vol 39, No 2, p 351-359. 1973. Illus.

Descriptors: *Soils, Crops, *Rice, Flooding, *Phosphates, Fertilizers, *Crop response.

Greenhouse experiments were conducted to evaluate the significance to flooded rice of the various forms of inorganic soil phosphate on Aborlan, Luisiana and Pili (Philippines) soils with and without phosphate. Changes in the various inorganic soils phosphate fractions with time under cropped and uncropped conditions were measured. The iron phosphate fraction was the most important source of phosphate to the rice plant. Phosphate added to the soils was slowly converted into the iron phosphate form. Transformation of soil phosphate seemed to be greatly affected by the presence of plant roots. Changes in the phosphate fractions were marked in the cropped soils.--Copyright 1974, Biological Abstracts, Inc.
W74-12925

REMOTE SENSING OF THE MOISTURE CONTENT OF THE ATMOSPHERE AND UNDERLYING SURFACE,
For primary bibliographic entry see Field 7B.
W74-12982

STEADY FLOW PATTERNS IN SATURATED AND UNSATURATED, ISOTROPIC SOILS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
P. A. C. Raats.
Journal of Hydrology, Vol 21, No 4, p 357-369, 1974. 3 fig, 1 tab, 17 ref.

Descriptors: *Soil water movement, *Flow system, *Saturated flow, *Unsaturated flow, Isotropy, Heterogeneity, Conductivity, Hysteresis, Darcys Law, Hydraulic conductivity, Velocity, Soils, Pressure head.
Identifiers: *Physical-mathematical model, Soil-atmosphere interface, Flow patterns, Tangent vector field, Streamlines.

A comprehensive analysis of steady flow patterns in saturated and unsaturated, possibly heterogeneous, isotropic soils is presented. At any point, the divergence of the unit tangent vector field to the streamlines is equal to the directional derivative along the streamlines of the orthogonal cross-sectional area of an infinitesimal stream tube divided by that area and also equal to the mean curvature of the surface of constant total head. Expressions are derived for the distribution of the flux, the water content, the velocity, the hydraulic conductivity, the total head, and the pressure head along a stream line or an infinitesimal stream tube. Among the results are a simpler derivation, further interpretation, and extension of earlier work on calculating the hydraulic conductivity distribution from detailed measurements of the total head distribution in combination with measurements of the hydraulic conductivity at a few locations. The jumps of various quantities at an interface also are discussed. (Schicht-ISWS)
W74-13007

ANOMALOUS TRANSMISSION OF WATER THROUGH CERTAIN PEATS,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
For primary bibliographic entry see Field 2F.
W74-13014

THE INFLUENCE OF SOIL CONDITIONERS ON STRUCTURE AND YIELDS IN HORTICULTURAL SUBSTRATES, (IN GERMAN),
For primary bibliographic entry see Field 3F.
W74-13022

A PROPOSED INTERIM STANDARD FOR PLUTONIUM IN SOILS,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W74-13136

THE MATHEMATICAL MODELING OF SOIL-WATER-NITROGEN PHENOMENA,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-13138

RECLAMATION STUDIES ON BLACK MESA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 5G.
W74-13144

NITROGEN FERTILIZATION OF FODDER SORGHUM M. P. CHARI (SORGHUM

BICOLOR) GROWN UNDER RAINFED CONDITIONS,
Indian Grassland and Fodder Research Inst., Jhansi.
For primary bibliographic entry see Field 3F.
W74-13146

APPLICATION OF RED-LEAD TO THE DETECTION OF DISSOLVED SULFIDE IN WATERLOGGED SOILS,
Universidade Federal da Bahia, Salvador (Brazil). Inst. of Geosciences.
H. U. Wiedemann.
Z Pflanzenernaehr Bodenkd. Vol 133, No 1/2, p 73-81. 1972. Illus.

Descriptors: *Aquatic soils, *Non-destructive tests, Testing, Analytical techniques, Sulfides, *Lead, Soil profiles, Estuaries, Georgia, Watersheds, Aquatic plants, Chemical analysis, Freshwater marshes, Sediments.
Identifiers: Redhead, Spartina-alterniflora, Spartina grass, Marsh soils.

A simple, inexpensive and non-disruptive technique for the detection and localization of dissolved sulfide in wet, waterlogged, and submerged soils was designed. Rods or sheets of inert material are painted with red-lead (Pb3O4), inserted into a soil, and exposed to it for 4 wk. Sulfide ions react with lead to form black lead sulfide (PbS). A black-on-red chemograph develops which accurately depicts the distribution of sulfide production in relation to the soil profile. Some deductions about a number of chemical parameters of the soil, include pH, redox potential, and the state of Mn and Fe can be made from the reaction of the lead compounds. The technique was used to determine sulfide production in the bottom sediment of a freshwater pond and was employed successfully in a study of different tidal marsh soils in an estuarine watershed on the coast of Georgia. Poorly drained soils, occupied by a dwarf form of Spartina alterniflora, were shown to have low redox potentials near--150 mV and high sulfide content. They could be distinguished from better-drained soils with less S activity but high Fe mobility supporting a lush growth of Spartina grass.--Copyright 1974, Biological Abstracts, Inc.
W74-13161

SALT PROFILES OF SOILS: INVESTIGATIONAL METHODS AND LEVEL OF SIGNIFICANCE: APPLICATION TO HALOMORPHIC SOILS IN SOUTHERN FRANCE (IN FRENCH),
Institut National de la Recherche Agronomique, Montpellier (France). Service d'Etudes des Sosl.
J. Servant.
Ann Agron (Paris). Vol 24, No 3, p 375-393. 1973. Illus. English, German and Russian summary.

Descriptors: *Soils, Europe, *Saline soils, Alkaline soils, *Analytical methods, Halophytes, *Soil profiles, Salinity.
Identifiers: *France, Saline profiles, Sodic solonchak, Sward, *Halomorphic soils.

The saline profile is defined as a result of opposed salinization and desalinization processes. The analytical approach is commented upon and some concepts relating to salt profiles are set forth: potential, agronomical, upward or downward, slightly differentiated saline profiles. A number of summer time saline profiles are investigated in halomorphic soils of Roussillon and Camargue (Southern France) by differentiating salt patches in cultivated land, coastal halophyte areas and inner salt depressions. Summer upward saline profiles feature the barren soils of the salt patches in cultivated land and the very saline spots called 'sansouire' in the halophyte Mediterranean coast area. These soils are classified as sodic solonchaks. The downward type of saline profiles were noted in soils covered with dense vegetation of halophytic sward and in areas where surface drainage is poor, a typical example of which are the inner depressions in Roussillon. In these periodically flooded salt depressions the downward type of saline profile is a permanent feature and the soil evolving through desalinization is classified in the saline alkali group.--Copyright 1974, Biological Abstracts, Inc.
W74-13162

NITROGEN TRANSFORMATIONS AND AVAILABILITY OF AN ANAEROBICALLY DIGESTED SEWAGE SLUDGE IN SOIL,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-13163

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION: VOLUME 9. SOILS OF THE LAKE MICHIGAN DRAINAGE BASIN--AN OVERVIEW,
Wisconsin Univ., Milwaukee. Dept. of Botany.
F. Stearns, F. D. Hole, and J. Klopatek.
Available from NTIS, Springfield, Va. 22161 as ANL/ES-40, Price $3.25 printed copy, $2.25 microfiche. Argonne National Laboratory, Illinois Report ANL/ES-40 (Vol 9), June 1974. 22 p, 1 fig, 1 tab, 28 ref. AEC Contract W-31-109-ENG-38.

Descriptors: *Soils, *Soil surveys, *Great Lakes region, *Lake Michigan, Land use, Environment, Urbanization, Cities.

Information on soils of the Lake Michigan drainage basin is summarized. Soil functions, morphology, classification, and land-capability scheme are described. Distribution of major soil groups is compiled for the basin area; the Podzols soil group is most abundant. The Brown Podzols account for about 46% of the basin area, and another 30% of the basin land is composed of Gray-Brown Podzols. Under favorable climatic conditions, forest land has been converted to agricultural land. However, forests appear to be prevalent and comprise the major land use of the basin soils. Agriculture ranks second. Increasing urbanization also has made its impact on soil use within the basin. In these urbanized areas soils are now covered largely by asphalt and concrete constructions. (Knapp-USGS)
W74-13169

EFFECTS OF RAINFALL AND DIFFERENTIAL APPLICATION OF N, P, K AND CA ON THE DOWNWARD MOVEMENT OF K IN AN AVALON MEDIUM SANDY LOAM CROPPED WITH MAIZE (ZEA MAYS L.),
Agricultural Research Inst., Cedara (South Africa).
M. P. W. Farina, and E. H. Graven.
Agrochemophysica. Vol 4, No 4, p 93-98. 1972, Illus.
Identifiers: Calcium, *Leaching, Nitrogen, Phosphorus, Potassium, Rainfall.

Soil and plant samples were obtained from a field experiment in which different levels of N, P, K and Ca were combined in a 34 factorial arrangement. The pattern of K movement in topsoil (0-15 cm) was measured over a period of 3 yr and related to rainfall and crop removal. The extent of K drainage to subsoil horizons over 2 seasons was determined and the effects of N, P, K and Ca levels on K movement to lower horizons assessed. Marked leaching of K from the surface horizon occurred. The extent of K loss of subsoil horizons was largely dependent upon rainfall and rate of K application and was unaffected by the addition of other fertilizers. Textural build-up prevented movement of K beyond the 45-60 cm zone. Although N and P had no direct effect on K movement to lower horizons, such losses were appreciably reduced by increases in plant uptake of K at high rates of N and P fertilization.--Copyright 1973, Biological Abstracts, Inc.
W74-13251

SPRING TIME SOWING OF PSAMMOPHYTES IN KARA KUM, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
M. Nurberdiev, G. Mukhammedov, and S. Bairamov.
Probl Osvoeniya Pustyn;. 2 p 67-71. 1973, English summary.
Identifiers: Kara-Kum, Soil moisture, *Psammophytes.

The success of reclamation developed in Kara kum depends on climatic conditions. The period for sowing plants is considered to be faavorable if the GPP (depth of soaked soil) reaches 60 cm to the end of Feb., and the amount of precipitation is not less than an average value (50-60mm). The best time for sowing of psammophytes is the beginning of spring, as soon as the daily average air temperature exceeds +5 degrees.--Copyright 1973, Biological Abstracts, Inc.
W74-13260

PLANTS AS INDICATORS OF HYDROLOGY AND LITHOLOGY IN THE ILI ANCIENT DELTA AREA, (IN RUSSIAN),
V. N. Ostrovskii.
Probl Osvoeniya Pustyn'. 3 p 43-48. 1973, English summary.

Descriptors: *Deltas, Vegetation, Groundwater, Petrology.
Identifiers: *Medication plants.

In the Ili ancient deltas (China, USSR) plant communities are used as the indicators of ground water depth, rate of ground water mineralization, annual amplitude of level changes and of surface soil thickness. The indicative value of certain plant communities is revealed with statistical treatment.--Copyright 1974, Biological Abstracts, Inc.
W74-13283

THE SEALING MECHANISM OF WASTE-WATER PONDS,
California Univ., Riverside. Dept. of Soil Science and Agriculture.
For primary bibliographic entry see Field 5D.
W74-13299

FEASIBILITY STUDY FOR THE ESTABLISHMENT OF DALMAJ PILOT PROJECT,
Institute for Applied Research on Natural Resources, Bagdad (Iraq).
For primary bibliographic entry see Field 3F.
W74-13346

VALUE OF SOIL CULTIVATION BETWEEN ROWS OF SUNFLOWER, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Maslichnykh i Efiromaslichnykh Kultur, Krasnodar (USSR).
P. G. Semikhnenko, and V. F. Baranov.
Dokl Vses Ord Lenina Akad S-kh Nauk Im V I Lenina, 10, p 8-9, 1972, Illus.
Identifiers: Herbicides, Sunflower, Treflan, *Soil moisture.

Cultivation of spaces between rows of sunflower plants at different depths up to 13 cm had little effect on the soil moisture content. The Kuban chernozem maintained an optimum density of 1.1-1.25 g/cm3. The application of the high-efficiency herbicide Treflan made cultivation of spaces between rows unnecessary.--Copyright 1973, Biological Abstracts, Inc.
W74-13351

HYDRIC CHARACTERISTICS OF PELOTAS SOILS, RIO GRANDE DO SUL, (IN PORTUGUESE),
Instituto de Pesquisas e Experimentacao Agropecuarias do Sul, Pelotas (Brazil).
E. I. G. Winkler, and W. J. Goedert.

Pesqui Agropecu Bras Ser Agron, 7, p 1-4, 1972, Illus. English summary.
Identifiers: *Brazil(Rio Grande do Sul), *Pelotas soils, *Soil moisture.

The relationship between soil moisture content and the tension in the various horizons of red-yellow podzol, planosol and gley soils was studied. Granulometric analysis was made and the distribution of pore spaces (total, noncapillary and capillary porosity) were determined. For each type of soil a characteristic moisture curve was obtained.--Copyright 1973, Biological Abstracts, Inc.
W74-13384

MODEL EXPERIMENTS SHOWING TRANSPORT OF FINE MATERIAL IN SOIL PORES (IN GERMAN),
Technische Universitaet, Munich (West Germany). Institut fuer Bodenkunde.
H. H. Becher, and K. H. Hartge.
Z Pflanzenernaehr Bodenkd. Vol 132, No 3, p 240-242. 1972. Illus. (English summary).
Identifiers: *Silt, Soil transport, *Soil Water Movement, *Model studies.

Experiments were conducted showing that silt translocation in a glass tube increased relative to water volume when the pressure gradient increased. The opinion, is confirmed that increasing velocity of water flux itself is a factor contributing to transport of material in unsaturated soils as compared to water-saturated situations.--Copyright 1973, Biological Abstracts, Inc.
W74-13402

AVAILABLE SOIL WATER: TIME-DISTRIBUTION IN A WARM SEASON RANGELAND,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
H. A. Schreiber, and N. G. Sutter.
J Hydrol (Amst). Vol 15, No 4, p 285-300. 1972. Illus.
Identifiers: Drought, *Evaporation, Grasses, Infiltration, *Soil moisture, Rainfall, Distribution patterns, *Soil water.

Daily total rainfall depths served as input to a computer program that estimated infiltration and subsequent evaporation. Printed output stated when a predefined start of the growing season occurred at Tombstone, Ariz., using official precipitation records from 1897 to 1970. The output listed moisture sequences by assigning a wet or dry status to the soil. The start of the growing season for perennial range grasses, defined as the presence of 4 consecutive days of wet soil, has occurred from June 8 to as late as early Sept, with a median start at July 14. The total number of wet days averaged 38 during the 4-mo period of June-Sept. Every year had at least 1 period of drought within the growing season; drought periods occurred an average of 6 times and could exceed 12. The average maximum dry period was 18 days; the corresponding wet period was 21 days. The starting wet period averaged 13 days and the ensuing dry period was 5 days. The maximum wet period tended to occur earlier in the season than the dry.--Copyright 1973, Biological Abstracts, Inc.
W74-13403

THE RELATION BETWEEN SOIL-WATER DIFFUSIVITY AND WATER CONTENT,
Technische Universitaet, Hanover (West Germany). Institut fuer Wasserwirtschaft und Landwirtschaftlichen Wasserbau.
P. W. Boochs, G. Battermann, and R. Mull.
Z Pflanzenernaehr Bodenkd. Vol 132, No 3, p 243-253, 1972. Illus. (English summary).
Identifiers: *Soil water movement, *Infiltration, *Diffusivity, Equations.

Moisture distribution as a function of time and distance were measured by X-ray absorption for fine sand, loess and clay. The diffusivities were determined by the method of Bruce and Klute or Whisler, Klute and Peters. The experimental diffusivities are approximated by an analytic expression. Using this expression the diffusivity equation is solved numerically and the horizontal water infiltration is described. A comparison between experimental data and computed curves shows a good agreement.--Copyright 1973, Biological Abstracts, Inc.
W74-13409

2H. Lakes

MORMON LAKE,
Arizona Academy of Science, Tempe.
For primary bibliographic entry see Field 6B.
W74-12784

BUILD-UP OF MINERAL CONTENT IN LAKE DARDANELLE AND THE EFFECT OF ZOOPLANKTON,
Arkansas Polytechnic Univ., Russellville. Dept. of Biological Science.
For primary bibliographic entry see Field 5C.
W74-12859

ANALYSIS OF NUTRIENT SUPPLIES FOR ALGAE IN ELEPHANT BUTTE RESERVOIR,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-12861

NUTRITIONAL PATTERNS OF SOME BACTERIA ISOLATED FROM FRESH WATER,
Tennessee Univ., Martin.
J. N. Trentham.
J Tenn Acad Sci. Vol 48, No 1, p 9-12, 1973.

Descriptors: *Bacteria, *Amino acids, Nutrient requirements, Yeasts, Lakes, Tennessee, Vitamins.
Identifiers: Reelfoot Lake(Tenn).

The nutritional requirements of 250 heterotrophic bacterial isolates from the surface water of Reelfoot Lake, Tennessee (USA) were examined. Sixty percent of these grew on a glucose-salts medium. Fifty-seven of the auxotrophs were classified according to their organic growth factor requirements. The requirements of these isolates were distributed among nutritional classes as follows: amino acids, 22; vitamins, O; amino acids and vitamins, 21; and complex factors provided by yeast extract, 14. Ten isolates requiring amino acids as their only organic factors did not require specific amino acids, but grew well in the minimal medium supplemented with any one of several amino acids.--Copyright 1973, Biological Abstracts, Inc.
W74-12969

MIREX: AN UNRECOGNIZED CONTAMINANT OF FISHES FROM LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W74-12990

THE DEVELOPMENT FROM TWO-DIMENSIONAL TO THREE-DIMENSIONAL TURBULENCE GENERATED BY BREAKING WAVES,
State Univ. of New York, Albany. Dept. of Atmospheric Science.
U. Lemmin, J. T. Scott, and U. H. Czapski.
Journal of Geophysical Research, Vol 79, No 24, p 3442-3448, August 20, 1974. 10 fig, 9 ref. NOAA Contract 2-353388.

Descriptors: *Turbulence, *Energy, *Lake Ontario, *Current meters, *Velocity, *Waves(Water), Lakes, Reynolds number, Thermocline, Epilimnion.
Identifiers: Energy spectrum, *Spectral analysis, Wave number, Two-dimensional, Three-dimensional, Kolmogorov's law, Coastal currents, Breaking waves.

An investigation was made of transition of the turbulence spectrum within the mixed layer of Lake Ontario following the passage of several well-defined meteorological disturbances. Observations were taken during the summer of 1972 with a ducted propeller current meter. Spectral analysis of the records revealed a transformation from a spectral law corresponding to two-dimensional turbulence into a wave number dependence corresponding to Kolmogorov's - 5/3 law indicating three-dimensional structure. It was proposed that this change over took place because of the exhaustion of the energy source. The appearance of the recordings, the energy peaks and energy levels, the mean velocities and the rms fluctuations showed concomitant changes which indicated that wave-generated turbulence may be transmitted downward in the epilimnion of lakes. (Bhowmik-ISWS)
W74-12996

A SURVEY OF THE ANIMAL COMMUNITY OF THE MAIN POND AT CASTOR HANGLANDS NATIONAL NATURE RESERVE, NEAR PETERBOROUGH,
M. Palmer.
Freshwater Biol. Vol 3, No 4, p 397-407. 1973. Illus.

Descriptors: *Aquatic animals, *Ponds, Hardness(Water), Analysis, National Wildlife Refuges.
Identifiers: *United Kingdom.

An account of the rich fauna of a pond in a hard-water district is given. A comparison is made with the fauna of Hodson's Tarn, (United Kingdom) which contains soft water. Some attempt was made to correlate the presence of various species with the environmental conditions provided by the pond.--Copyright 1974, Biological Abstracts, Inc.
W74-12997

METHYLMERCURY: BACTERIAL DEGRADATION IN LAKE SEDIMENTS.
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W74-13038

ORGANOCHLORINE RESIDUES, MERCURY, COPPER AND CADMIUM IN YELLOW PERCH, WHITE BASS AND SMALLMOUTH BASS, LONG POINT BAY, LAKE ERIE,
Ontario Ministry of Natural Resources, Port Dover.
For primary bibliographic entry see Field 5C.
W74-13093

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 15. MAMMALS OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ., Stevens Point. Museum of Natural History.
For primary bibliographic entry see Field 6G.
W74-13121

CHARACTERISTICS OF BACTERIA IN WATER LAYERS OF THE SOUTH BAIKAL, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W74-13157

LIMNOLOGICAL, ICHTHYOLOGICAL, AND PARASITOLOGICAL INVESTIGATIONS ON ARKANSAS RESERVOIRS IN RELATION TO WATER QUALITY,
Arkansas Univ., Fayetteville. Dept. of Zoology.

J. S. Carter, C. E. Hoffman, L. L. Olmsted, R. V. Kilambi, and D. G. Cloutman.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 680, $8.50 in paper copy, $2.25 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Completion Report, Publication, No 22, 1974. 272 p, 34 fig, 40 tab, 97 ref. OWRT A-013-ARK(1).

Descriptors: *Physicochemical properties, Phytoplankton, Zooplankton, *Fish parasites, *Bass, Fisheries, *Fish food organisms, *Fish populations, Environmental effects, Eutrophication, Fish predators, Oligotrophy, *Arkansas, Reservoirs, Water quality.
Identifiers: *Diversity indices, Monomictic reservoirs.

Thirteen physico-chemical parameters and net plankton monitored indicated that Lake Fort Smith is a warm monomictic, oligotrophic, relatively non-productive reservoir, which has shown little eutrophication since impoundment in 1936, and is an excellent soft-water supply. Species diversity indices of helminth and crustacean parasites of selected game fishes revealed that their parasite communities had reached climax. The combined effects of 13 physico-chemical factors, age, and sex of the host accounted for less than 50% of the variance in abundance of fish parasites, with temperature and turbidity the most important limiting factors. Seasonal changes in individual diversity and community diversity of fish parasites seemed to be correlated mostly with temperature, dissolved oxygen, and turbidity. The ecology of largemouth and spotted bass was studied including population dynamics. Feeding frequency and mean diet weight were regressed on seven physico-chemical parameters and these parameters accounted for a larger percentage of variability in frequency of feeding than in mean diet weight. Environmental factors were, therefore, particularly important in triggering feeding, but once feeding began the extent was determined by factors such as prey density, predator-prey interaction, and degree of satiation.
W74-13167

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION: VOLUME 9. SOILS OF THE LAKE MICHIGAN DRAINAGE BASIN--AN OVERVIEW,
Wisconsin Univ., Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 2G.
W74-13169

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Rockville, Md.
Available from NTIS, Springfield, Va 22161 as COM-73-10914, Price $5.25 printed copy; $2.25 microfiche. International Field Year for the Great Lakes (IFYGL) Bulletin No 4, September 1972. 120 p.

Descriptors: *Great Lakes, *Limnology, Hydrology, Meteorology, Reviews, Water balance, Remote sensing, Water analysis, Data collections, Data processing, Canada, United States, Lake Ontario.

Some preliminary results of the joint study by Canada and the United States during the International Field Year for the Great Lakes are presented. Aspects included are the atmospheric water balance project, remote sensing, the intercomparison study, the Niagara Bar Micrometeorological Project, the Woodbridge Radar Observing and Data Processing System, data management, the thermal structure and heat content of Lake Ontario, lake levels, tasks and projects of the U.S., and calibration, standardization, and evaluation of chemical analyses. (Knapp-USGS)
W74-13178

COMPARISON OF BACTERIAL AND PHYTOPLANKTON POPULATIONS UNDER NATURAL AND LABORATORY CONDITIONS,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5C.
W74-13182

OBSERVATIONS ON PLANKTONIC DIATOMS IN THE LAKE-RIVER SYSTEM LAKE MJOSA-LAKE OYEREN-RIVER GLAMA, NORWAY,
Norsk Institutt for Vannforskning, Blindern.
E. A. Lindstrom, R. Skulberg, and O. M. Skulberg.
Norw J Bot. Vol 20, No 2/3, p 183-195. 1973.

Descriptors: *Plankton, *Diatoms.
Identifiers: Asterionella-formosa, Diatoma-elongatum, Diatoms, Fragilaria-crotonensis, Glama, Lake, Melosira-italica-ssp-subarctica, Mjosa, Norway, Oyeren, Periodicity, Planktonic, Rhizosolenia-eriensis, River, Seasonal, System, Tabellaria-fenestrata-var-asterionel, Lake Mjosa(Norway), Lake Oyeren(Norway), *Norway.

The planktonic vegetation of diatoms in the lake-river system Lake Mjosa-Lake Oyeren-River Glama has been observed extensively since 1958. The general features of diatom development are reported. The diatom vegetation is a coherent and continuous phenomenon revealing a fairly well-defined seasonal periodicity. Asterionella formosa Hass., Fragilaria crotonensis Kitton, Diatoma elongatum (Lyngb.) C. A. Ag., Tabellaria fenestrata var. asterionelloides Grun., Rhizosolenia eriensis H. L. Smith and Melosira italica ssp. subarctica O. Mull. are dominant species. The results of the survey are compared with results from previous investigations of Lake Mjosa, and changes which have taken place are noted. F. crotonensis is a newcomer to the plankton, at least as a predominant species.--Copyright 1974, Biological Abstracts, Inc.
W74-13341

THE DESMIDS OF THE HALOPLANKTON OF LAKE VALENCIA, VENEZUELA, (IN GERMAN),
K. Foerster.
Int Rev Gesamten Hydrobiol, Vol 57, No 3, p 409-428, 1972. English summary.
Identifiers: Cosmarium, Desmids, Membranes, New, Plankton, Species, Subspecies, Temperature, Valencia, Venezuela, *Haloplankton, Lake Valencia.

Lake Valencia is without an outlet, and it has a salinity of 0.6%, the main ions being SO4(-2) and HCO3(-3). The surface temperature varies from 27-31C. It is highly eutrophic. There are few desmids, and those species that occur are not abundant. Fifteen species were identified, of which Cosmarium moniliforme subelongatum and C. pustulatum are new. C. calcareum Wittrock spetsbergense is a new combination replacing C. subcostatum Lundell spetsbargense Borge. Evidently as an adaptation to the saline conditions, some species show an enlargement of the cells; and the membranes of the cells are thickened.--Copyright 1973, Biological Abstracts, Inc.
W74-13353

SEASONAL VARIATIONS IN THE DIET OF ANATIDAE IN THE GORKI WATER STORAGE BASIN, (IN RUSSIAN),
Gorkii State Univ. (USSR).
A. V. Molodovskii.
Vestn Zool, Vol 7, No 2, p 70-76, 1973. English summary.
Identifiers: *Anatidae, Gorki basin, *Bird diet.

The seasonal character of a nutrition change in 14 spp. of Anatidae was studied in the lake part of the water storage basin and its Unzhenian and Nemdskian spurs (USSR) in 1959-1964. Content of 326 stomachs was investigated in adult and young flying birds. The volume of different groups of Anatidae fodder was estimated by sight. The estimation showed that selectivity of fodder in Anatidae of different species was manifested in distinctly expressed seasonal alternation of different groups of food. Abundance and accessibility of most fodder kinds depends on seasonal and annual regularities of their maturation and water level in the water storage basin.--Copyright 1973, Biological Abstracts, Inc.
W74-13354

LARGE ECOLOGICAL ZONES OF LAKE CHAD, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad).
J.-P. Carmouze, C. Dejoux, J.-R. Durand, R. Gras, and A. Iltis.
Cah O R S T O M Ser Hydrobiol, Vol 6, No 2, p 103-169, 1972, Illus. English summary.
Identifiers: Ecological studies, Africa, Hydrology, Insects, Macrophytes, Plankton, Snails, *Chad(Lake Chad).

Climate, geomorphology, hydrology, water physics and chemistry are discussed. The main distribution areas are analyzed for: phytoplankton, macrophytes, zooplankton, oligochaetes, insects, snails and fish. For every group, a marked difference appears between northern and southern parts of the lake (Central Africa). The south is greatly disturbed by the flow of the Chari and is, to a certain extent, similar to the river system. The northern part is more steady and represents the lake stricto sensu. It was not possible to draw up a general zonation although factors such as water depth, landscape (open water, archipelago) or bottom deposits are certainly important ones. Some organisms are missing or rare beyond certain levels in water conductivity: Oligochaeta (Alluroidiae), benthic snails (except Malania) and fishes (mainly Mormyridae). Quest for food does not seem to be of great importance in fish distribution. Several examples derived from Macrophytes, zooplankton, snails and fish show that deep changes have occurred from 1965-1972. At the present time, the lake level is 2.5 m below the 1965 leve, causing great changes associated with shallowness.--Copyright 1973, Biological Abstracts, Inc.
W74-13356

FIELD STUDIES ON THE GONOTROPHIC CYCLE OF AEDES AEGYPTI IN BANGKOK, THAILAND,
World Health Organization, Bangkok (Thailand). Aedes Research Unit.
C. P. Pant, and M. Yasuno.
J Med Entomol, Vol 10, No 2, p 219-223, 1973.
Identifiers: *Aedes aegypti, Arbovirus, Dengue, Fever, *Thailand(Bangkok), *Mosquitoes.

The gonotrophic cycle of A. aegypti, the principal vector of dengue hemorrhagic fever, was studied during the wet, cool-dry, and hot seasons in Bangkok using a technique of release and recapture of mosquitoes of known age and physiological condition. During the cool-dry season there was a delay of 1-2 days, in comparison with the other seasons, before the mosquitoes took their 1st blood meal. The duration of the gonotrophic cycle during the hot season was 3 days. The delay in taking a blood meal during the cool-dry months reduces the degree of man-mosquito contact and consequently the vectorial capacity of the mosquito. The implications of the findings on the strategy of control operations against adult mosquitoes are discussed.--Copyright 1974, Biological Abstracts, Inc.
W74-13365

LAKE BULL TROUT,
Polskie Towarzystwo Przyrodnikow im. Kopernika, Krakow.
Z. Wajdowicz.

Wszechswiat, 1, p 15-17, 1973, Illus.
Identifiers: *Poland(Lake Bull), Salmo-Salar, Salmo-Trutta, *Trout.

A general description of fish belonging to the Salmonidae is given, including notes on the natural conditions necessary for their propagation and development. Two species belonging to the genus Salmo are or were known to occur in Poland, Salmo salar and Salmo trutta; however, both are rapidly disappearing due to the progressing pollution of river waters. Efforts have been undertaken to adapt the lake bulltrout (Salmo trutta m. lacustris), occurring hitherto only in the Wdzydzkie Lakes in Poland, to new biotopes. The 1st stage of acclimatization has now been concluded and has led to the successful stocking of an artificial basin formed by damming the Sola River with this subspecies. It is now planned that other sub-Carpathian lakes will be designated for the same purpose.--Copyright 1974, Biological Abstracts, Inc.
W74-13366

DATA ON THE BIOLOGY OF SELENGI OMUL JUVENILES COREGONUS AUTUMNALIS MIGRATORIUS (GEORGI), (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W74-13376

STUDIES ON BIOLOGY OF MASTACEMBELUS PANCALUS (SPINY EEL, HAMILTON) IN ARTIFICIAL PONDS: I. NATURAL HABITAT, DISTRIBUTION, FOOD AND FEEDING HABITS, AND ECONOMIC IMPORTANCE,
Bangladesh Agricultural Univ., Mymensingh. Dept. of Agricultural Management.
A. M. Karim, and A. Hossain.
Bangladesh J Biol Agric Sci, Vol 1, No 2, p 10-14, 1972, Illus.
Identifiers: Diptera, *Eels, Habitats, *Mastacembelus, Ponds.

The results of a 12-mo. study of natural habitat, distribution, and food and feeding habits of M. pancalus in Ponds 2 and 4 of Bangladesh Agricultural University Campus, Mymensingh, are presented. The ponds have surface areas of 2.38 and 6.55 acres and maximum depths of 7.5 and 8.0 feet, respectively. These were practically devoid of aquatic vegetation except for a few water hyacinth in the water areas close along the banks. A total of 295 specimens (including post-larvae) of M. pancalus was collected from the ponds during the study period. The highest catch of fish was in May and the lowest in March and April. The percentage of male and female varied from 14.1-60.0 and from 15.5-57.1, respectively. In aggregate, the ratio of male to female was 50.27:49.73. Stomach content analysis indicated that M. pancalus lived on variety of food materials which included larvae of Lepidoptera, Diptera, Hemiptera, and sand grains and debris. In fact, sand grains and debris constituted about 57.54 percent of all food materials taken together.--Copyright 1973, Biological Abstracts, Inc.
W74-13387

RECONNAISSANCE LIMNOLOGY OF SUB-ANTARCTIC ISLANDS: I. CHEMISTRY OF LAKE WATERS FROM MACQUARIE ISLAND AND THE ISLES KERGUELEN,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
P. A. Tyler.
Int Rev Gesamten Hydrobiol, Vol 57, No 5, p 759-778, 1972, Illus.
Identifiers: Kerguelen island, Lakes, Limnology, Macquarie island, *Water chemistry, *Antarctic.

The plateau lakes of Macquarie Island and Kerguelen illustrate the dominant role of the sea in the chemistry of lakes on Sub-Antarctic islands. The salinity of the waters depends on distance from the coast in the direction of prevailing winds, and ionic composition points to sea spray as the major supplier of ions. Geochemical influence is slight but varies from lake to lake. The lake waters are soft, slightly-colored or colorless, and have a pH near neutrality or moderately acid.--Copyright 1973, Biological Abstracts, Inc.
W74-13389

MASS PRODUCTION OF ROTIFERS FOR THE CULTURE OF FISH AND SOME SHRIMP LARVAE (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
I. B. Kim.
Bull Kor Fish Soc. Vol 5, No 2, p 45-49. 1972. Illus. (English summary).
Identifiers: Brachionus, Chlorella, Daphnia, Filina, *Fish larvae, *Rotifera, Scendesmus, *Shrimp.

Outdoor concrete ponds, each 16 m2, were used to culture the rotifers, Brachionus calyciflorus and Filinia longiseta. B. calyciflorus usually attained the population of about 100 individuals/ml of pond water. Dipterex was usually applied to control Daphnia and other crustaceans that generally appear and feed on rotifers. A concentration of 0-16-0.2 ppm in the pond water was sufficiently effective to control these natural predators of rotifers. Poultry dung was very effectively used to culture rotifiers. The fertilization ratio was about 8 kg each pond with 30 cm depth of water. The tiny rotifier, F. longiseta attained a very high population density of about 1000 individuals/ml of pond water, but they were very sensitive to Dipterex, and for this aspect future investigation may be needed. In outdoor ponds, the multiplication of rotifiers significantly decreased when the water temperature falls to about 20C in autumn. In the laboratory, unicellular planktonic algae such as Scenedesmus or Chlorella, as the food of rotifers, were collected from the outdoor ponds by dipping them together with water, and were effectively used for the culture of B. calyciflorus. If the planktonic algae are cultured in specially designed containers, the sunlight would be the most effective means as the source of light. B. calyciflorus cultured in the outdoor ponds by the Dipterex controlled method was highly efficient to rear the early fry of marble gourami. The Dipterex content mixed in the water to control the crustacean predators of rotifers showed no harm to the gourami fish fry.--Copyright 1973, Biological Abstracts, Inc.
W74-13405

A STUDY ON THE GROWTH OF THE MUSSEL, MYTILUS EDULIS, IN A SALT-FIELD RESERVOIR (IN KOREAN),
Dong Kook Univ., Seoul (Republic of Korea).
C. Lee, Y. S. Ko, and J. K. Lee.
Bull Kor Fish Soc. Vol 5, No 3, p 71-75. 1972. Illus. (English summary).
Identifiers: *Lorea, *Mussels, Mytilus, *Growth rates, Hydrogen ion concentration, *Reservoirs(Salt-field).

The growth of the mussel, M. edulis, in a salt-field reservoir was investigated at Dangjin, Choongnam (Korea) from June-Oct. 1970. Temperature, salinity, specific gravity, and pH of water were 22.5-27.5C, 28.6-34.8%, 1.019-1.024, and 7.6, respectively in the salt-field reservoir from June 20 to July 19. Three species of Gastropoda and 7 spp. of Pelecypoda were collected. The shell height of the mussel group in the highest abundance increased from 200 mm (15 approx. 25 mm) on June to to 40 mm (20 approx. 50 mm) on Sept. 26 in the salt-field reservoir, whereas the average shell heights were 19.80 mm (June 15) and 35.10 mm (Sept. 26), respectively. The daily growth of the mussel from July 10 to Aug. 12 was 0.22 mm in shell height and highest during the experimental period. The relationships between shell length (L) and shell height (H), and between shell length (L) and shell breadth (B) of the young mussel are represented by the following equations respectively: H = 1.26776L + 5.07978, B = 0.35041L + 3.05502. From the above results, it is suggested that the culture of the mussel M. edulis, in a salt-field reservoir is possible.--Copyright 1973, Biological Abstracts, Inc.
W74-13406

STUDIES ON GULL LAKE, MICHIGAN: II. EUTROPHICATION: EVIDENCE AND PROGNOSIS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W74-13456

THE RESPONSE OF LARVAE OF PERLA BURMEISTERIANA CLAASSEN (PLECOPTERA) TO VARIATIONS IN HYDROSTATIC PRESSURE, (IN FRENCH),
Biological Research Station, Bacau (Rumania).
I. Miron.
Hydrobiologia. Vol 42, No 2/3, p 345-354, 1973. Illus. English summary.

Descriptors: *Larvae, *Hydrostatic pressure, Impoundment.
Identifiers: Perla burmeisteriana, *Romania.

To explain the reactions of larvae of P. burmeisteriana to an ecological change following the impoundment of a man-made lake on River Bistritza (Romania), some experiments on the responses of this species to variations of hydrostatic pressure were undertaken. Experiments were carried out in Lake Bicaz France. Observations were direct, either by diving or by monitoring the situation visually from a submerged laboratory. Sets of 40 specimens were exposed to pressure of 1, 1.5 or 2 atmospheres. Survival time of the larvae decreased as pressure increased. This phenomenon is temperature dependent. Pressure influences gaseous exchange, by altering the rate of elimination of CO2. This finally leads to hypercapnia.--Copyright 1974, Biological Abstracts, Inc.
W74-13458

RECIPROCAL INFLUENCE OF LARGE RESERVOIRS AND ADJACENT TERRITORIES IN DIFFERENT NATURAL CONDITIONS OF THE USSR,
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 5C.
W74-13466

CALAMOECIA LUCASI (COPEPODA, CALANOIDA) AND OTHER ZOOPLANKTERS IN TWO ROTORUA, NEW ZEALAND, LAKES,
Waikato Univ., Hamilton (New Zealand). School of Science.
M. A. Chapman.
Int Rev Gesamten Hydrobiol. Vol 58, No 1, p 79-104, 1973. Illus.

Descriptors: *Zooplankton, *Lakes, Seasonal, *Copepods.
Identifiers: Lake Rotorua(NZ), Lake Rotoiti(NZ), *New Zealand.

The seasonal cycles of the zooplankton in 1967-1969 in Lake Rotorua and Rotoiti in the North Island of New Zealand are outlined. Bosmina meridionalis had several peaks in abundance during the summer and low winter numbers; Ceriodaphnia dubia had only a single period of real abundance during the summer. The rotifer Asplanchna priodonta was present throughout the year in low numbers except for 2 brief but striking peaks in the spring-summer period. The only cyclopoid copepod present was Macrocyclops albidus which was never abundant. The annual cycles of the calanoid copepod Calamoecia lucasi were studied in some detail. Total numbers were high but very variable during spring-autumn and low in winter, the seasonal cycles being very similar in both lakes. Breeding was continuous although egg clutches were small (1.1-6.6) and the

development of at least 5 cohorts/yr could be followed from data on breeding intensity, population age-structure and adult size. Laboratory determined egg development rates were used to calculate birth rates in the populations so that production and losses could be estimated. Survival rates were higher in Rotoiti than in Rotorua. Birth and death rates were low; the annual means for both linear and exponential rates ranged from 0.04 to 0.07 giving turnover times for individuals of 12-18 days in Rotorua and 18-24 days in Rotoiti. Population turnover rates were higher in Rotorua (19-28 days) which had a similar population/sq m but higher clutch sizes than in Rotoiti (18 days).--Copyright 1974, Biological Abstracts, Inc.
W74-13467

INVESTIGATIONS ON THE CATION-CONTENT IN A BOG: I. DIFFERENCES IN THE VEGETATION-COMPLEXES, (IN GERMAN),
Frankfurt Univ. (West Germany). Botanical Inst.
W. Loetschert, and T. Gies.
Flora (Jena). Vol 162, No 3, p 215-243, 1973. Illus. English summary.

Descriptors: Europe, *Bogs, Wetlands, Mosses, Fen, Aquatic plants, *Chemical analysis, Calcium, Sodium, Potassium, Magnesium, *Subsurface waters, Ions, Cations, Water analysis.
Identifiers: Bog, Calcium, Cation, Fen, Galium-pumilum, Ion, Magnesium, Poa-chaixii, Potassium, Sodium, Sphagnum-cuspidatum, Vegetation, Moors, *Germany.

The following plant communities were found in the bog-system of the Schwarze Moor in the Rhon-Mountain, Germany: Fen: Galium pumilum--Poa chaixii association, Nardo-Juncetum squarrosi, Junco-Molinietum and Caricetum rostratae; Transitional fen: Carici canescentis-Agrostidetum caninae, Lycopodio-Betuletum pubescentis, Polytrichum strictum- and Cladonia association and Piceetum; Bog: Sphagnum cuspidatum association and (=Caricetum limosae) Sphagnetum europaeum rhoenanum. The Ca, Na, K and Mg ion concentrations and the pH-values were analyzed in the subsoil water of the plant communities during 2 yr. The following ionic compositions are typical for the bog-system: Fen: pH = 4.9-6.3, Ca++ = 3.0-10.0 mg/l, Na+ = 1.6-4.8 mg/l, K+ = 0.3-1.0 mg/l, Mg++ = 1.6-4.0 mg/l; Transitional fen: pH = 3.7-4.2, Ca++ = 0.9-2.0 mg/l, Na+ = 0.9-1.4 mg/l, K+ = 0.1-0.6 mg/l, Mg++ = 0.4-0.7 mg/l; Bog: pH = 3.7-4.1, Ca++ = 0.6-1.2 mg/l, Na+ = 0.7-1.3 mg/l, K+ = 0.15-0.4 mg/l, Mg++ = 0.2-0.6 mg/l. The central bog plane was not influenced by miner l soil water. There were also no higher concentrations on places where species characteristic for fen vegetation appeared. Statistical differences in concentrations of water samples in the Sphagnetum fusci, Sphagnetum magellanici and the Sphagnetum tenelli were not found. The differentiation of the Schwarze Moor in bog, transitional fen and fen is the result of the topographic conditions and the flow of soil water minerals. There is some influence in the differentiation of the bog plant communities caused by different concentrations of cations. A comparison of known cation concentrations of European bogs and the results found in the Schwarze Moor shows that there are typical ionic concentrations in each European bog area. (See also W74-13471)--Copyright 1974, Biological Abstracts, Inc.
W74-13470

INVESTIGATIONS ON THE CATION-CONTENT IN A BOG: II. SEASONAL CHANGES AND INFLUENCE OF THE SPHAGNUM VEGETATION, (IN GERMAN),
Frankfurt Univ., (West Germany). Botanical Inst.
T. Gies, and W. Loetschert.
Flora (Jena). 162(3): 244-268. Illus, 1973, English summary.

Descriptors: Europe, *Bogs, Wetlands, Calcium, Magnesium, Sodium, Potassium, Ion exchange, Cation exchange, *Subsurface waters, *Chemical analysis, Mosses, Aquatic plants, Water analysis.
Identifiers: Sphagnum, Sphagnum-spp, Vegetation, Moors, *Germany, Kolk, Flarks.

The Ca, Mg, Na and K-ion concentrations and the pH values were analyzed in 'kolk,', 'flarks' (bodies of water on the moor) and in the subsoil water of the Schwarze Moor in the Rhon-Mountain, Germany. The concentrations of the cations fluctuate more than previously found in Central European bogs. Low and high concentrations of the electrolytes may appear according to the different conditions of weather and cation exchange in the Sphagnum-plants at any time within the period investigated. An annual periodicity is not seen. The same amount of rain causes different concentrations of cations in the investigated areas according to the capacity and cation adsorption of the Sphagnum plants. The cation adsorption and the cation exchange of living Sphagnum-mosses are confirmed by measurements under natural conditions. There are great differences in the concentrations of cations in the neighborhood of Sphagnum-mosses, in the water between Sphagnum-plants and the concentrated solution pressed out of Sphagnum-plants. Cations are also increased in the heads of 'blutforming' (sporophyte formation) Sphagnum-mosses. It is significant for the ecology of the bogs that the Sphagnum-mosses are able to store more cations in their heads than they need for nutrition. Besides this, the Sphagnum-mosses lower the pH-value permanently by cation exchange. The changing concentrations in bog water are on the one hand the result of weather and on the other hand the result of cation exchange and wash out of accumulated cations of Sphagnum-mosses. (See also W74-13470)--Copyright 1974, Biological Abstracts, Inc.
W74-13471

LIMNOLOGICAL ASPECTS OF SOME MOROCCON ATLAS LAKES, WITH REFERENCE TO SOME PHYSICAL AND CHEMICAL VARIABLES, THE NATURE AND DISTRIBUTION OF THE PHYTO- AND ZOOPLANKTON, INCLUDING A NOTE ON POSSIBILITIES FOR THE DEVELOPMENT OF AN INLAND FISHERY,
Ghent Rijksuniversiteit (Belgium). Zoology Inst.
For primary bibliographic entry see Field 5C.
W74-13476

A CRITICAL STUDY OF METHODS IN NUMERICAL TAXONOMY: THE CLASSIFICATION OF AQUATIC BACTERIA, (IN FRENCH),
For primary bibliographic entry see Field 5C.
W74-13487

POPULATION DYNAMICS OF HATCHERY-REARED LANDLOCKED SALMON, SALMO SALAR, AT SCHOODIC LAKE, MAINE,
Maine Dept. of Inland Fisheries and Game, Augusta.
K. A. Havey, and P. S. Andrews.
Trans Am Fish Soc. Vol 102, No 4, p 728-738. 1973, Illus.

Descriptors: *Salmon, *Fish populations, *Maine, Fish hatcheries.
Identifiers: *Schoodic Lake(Maine), Salmo salar.

Landlocked salmon, Salmo salar, were introduced into Schoodic Lake, Washington, County, Maine, in 1960. From 1963-70, 9 groups of stocked salmon were studied to obtain information on survival, standing crops, the salmon sport fishery, and population density-catch relationships. Average survival from age I+ to age II+ (4 groups) was 47.9%, from age II+ to age III+ (5 groups) 53.1%, from age III+ to age IV+ (3 groups) 23.9% and from age IV+ to age V+ (4 groups) 14.2%. Few salmon survived beyond age V+. Annual survival, excluding fishing mortality, for 4 groups of young salmon ranged from 26.4%-61.6%. Survival from planting to 6 mo. at large for 1 group was 72.6%. Annual survival after death from all causes ranged from 17.6% for 1 group of salmon from III+ - IV+ to 73.1% for 1 group of salmon from II+ - III+. Numerical annual standing crops from 1964-69 computed by the Petersen method ranged from 4.0 plus or minus 1.0 - 13.8 plus or minus 2.0 fish per ha. Standing crops from 1964-69 ranged from 2.5 plus or minus 0.4 - 3.4 plus or minus 1.0 kg per ha. Catch/angler hour by sporting fishing ranged from 0.036 in 1969 to 0.229 in 1967. Annual mean number of salmon checked was 164. Salmon creeled averaged 38.6 plus or minus 0.5 cm in total length and 0.5 plus or minus 0.04 kg in weight. Based on an estimated 75.0% census, mean numerical yield was 1.4 fish/ha. Mean weight Yield, was 0.7 kg/ha. Of 12,107 salmon stocked, 8.6% were subsequently checked in angler's creels. Salmon stocked at ages I+, I, and 0+ yielded returns of 14.3%, 8.9%, and 5.4% respectively. Mean effort/ha/hear was 6.9 angler hours. There is a linear relationship (1964-69 data) between population density expressed as numbers/ha and numbers/ha captured by fall trap netting. There is also a linear relationship between population density expressed as numbers/ha and catch/angler hour of all salmon the following fishing season.--Copyright 1974, Biological Abstracts, Inc.
W74-13488

CANNIBALISM AS A FACTOR IN FIRST YEAR SURVIVAL OF WALLEYE IN ONEIDA LAKE,
J. R. Chevalier.
Trans Am Fish Soc. Vol 102, No 4, p 739-744. 1973, Illus.

Descriptors: *Walleye, *Fish mortality, *New York.
Identifiers: *Fish cannibalism, *Oneida Lake(NY).

The role of cannibalism in determining year class strength of walleyes in Oneida Lake, New York, was evaluated. From mid-July 1969-May 1970, the abundance of young walleyes was monitored by trawling and the stomachs of adult walleyes collected in trawls and gill nets were examined. Number of young walleyes consumed was estimated from occurrence in adult walleye stomachs, digestion rates and estimated number of adults. Daily consumption ranged from 0.044 young walleys/adult in Aug. to 0.002 in winter. Monthly cannibalism, estimated by the multiplication of daily consumption by the number of days and the number of adult walleyes, varied from 1,053,000 young in Aug. to 240,000 in winter. Cannibalism declined proportionally with abundance of young walleyes. Overwinter mortality rates in 1969-1970 were highest for small young-of-the-year walleyes because adult walleyes were size-selective in preying upon young.--Copyright 1974, Biological Abstracts, Inc.
W74-13489

CONTRIBUTION TO THE GROWTH OF THE BEAM, ABRAMIS BRAMA (LINNAEUS, 1758) (OSTEICHTHYES, CYPRINIDAE) IN THE SLAPY WATER RESERVOIR, BETWEEN 1957 AND 1965,
J. Poupe.
Vestn Cesk Spol Zool. Vol 37, No 2, p 104-109, 1973, Illus.

Descriptors: *Benthos, *Reservoirs, Biomass, *Growth rates.
Identifiers: *Abramis-brama, *Bream, *Czechoslovakia(Slapy Valley reservoir).

The growth of the Bream, Abramis brama in the Slapy Valley Reservoir in Bohemia, south of Prague, Czechoslovakia was studied. The growth was evaluated according to samples collected in the years 1957-1958 and 1963-1965. A total of 707 specimens were examined. Those factors (commercial fishing, decreased benthic biomass due to cold water in flow and water level fluctua-

tions, winter suffogation under ice and angling) which could influence the growth not only in the years 1957-1965, but up to the year 1970, are taken into account. In the course of the period under review the growth was retarding.--Copyright 1974, Biological Abstracts, Inc.
W74-13494

ALGAL ASSAYS OF ARCHIPELAGO WATERS: QUANTITATIVE ASPECTS,
Lantbrukshogskolan, Uppsala (Sweden). Institutionen for Vaxtfysiologi.
For primary bibliographic entry see Field 5C.
W74-13495

POTENTIAL PRODUCTIVITY OF AN ALPINE LAKE AS INDICATED BY REMOVAL AND REINTRODUCTION OF FISH,
British Columbia Univ., Vancouver. Inst. of Fisheries.
For primary bibliographic entry see Field 5C.
W74-13496

2I. Water In Plants

XYLEM SAP TENSION IN THREE WOODLAND OAKS OF CENTRAL CALIFORNIA,
California Univ., Carmel Valley. Hastings Natural History Reservation.
J. R. Griffin.
Ecology. Vol 54, No 1 p 152-159, 1973. Illus.

Descriptors: *Oak trees, *Xylem, Trees, Tension, Forests, California, Grasslands.
Identifiers: Quercus-agrifolia, Quercus-douglasii, Quercus-lobata, Sap.

In mid-Aug. bottomland Quercus agrifolia and Q. lobata trees had low xylem sap tensions, as estimated by a pressure chamber. After a very dry winter, pre-dawn minimum tensions were less than 6 atm, suggesting that these trees were rooted to a water table. Widely spaced Q. lobata trees in upland savannas also had low pre-dawn tensions, presumably due to the lack of woody plant competition. In contrast, all stands of Q. douglasii had high pre-dawn tensions wven after a very wet winter. They seem well adapted to dry slopes where the water table is usually unavailable. Q. douglasii trees appear to drop their leaves when the water supply becomes critical. Trees in some north aspect stands had higher tensions in mid-Aug. than trees in south aspect stands due to soil moisture supply and tree density interactions. During the dry season a size-class effect appeared with tension inversely correlated with crown size and probably root depth.--Copyright 1973, Biological Abstracts, Inc.
W74-13035

WATER STRESS IN KRUMMHOLZ, WASATCH MOUNTAINS, UTAH,
Utah Univ., Salt Lake City. Dept. of Biology.
D. H. Hansen, and L. G. Klikoff.
Bot Gaz. Vol 133, No 4, p 392-394, 1972.

Descriptors: *Stress, *Trees, Coniferous trees, Utah.
Identifiers: Krummholz, Picea-engelmannii, Potential, Wasatch mountains(Utah).

The krummholz form of Engelmann spruce (Picea engelmannii) was found to develop water potentials below -90 bars during the winter. Changes in sugar concentration associated with cold hardiness could not account for such low water potentials. These low water potentials may reflect a frozen substrate and windy conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-13036

PRODUCTIVITY AND NUTRIENT TURNOVER IN MIRE ECOSYSTEMS: I. COMPARISON OF TWO METHODS OF ESTIMATING THE BIOMASS AND NUTRIENT CONTENT OF CLADIUM MARISCUS (L.) POHL,
Nottingham Univ. (England). Dept. of Botany.
J. O. Rieley, and M. Jasnowski.
Oecol Plant. Vol 7, No 4, p 403-408, 1972.

Descriptors: *Bogs, *Marshes, Swamps, Crop production, *Nutrients, Biomass, Calcium, Potassium, Sodium, Productivity, Ecosystems, Magnesium.
Identifiers: *Cladium mariscus, Mire.

The annual production of C. mariscus estimated from end of growing season standing crop using (a) clear cropping and (b) single plant methods is 22.7 and 22.4 t.ha-1, respectively. Chemical analysis of plant parts shows the magnitude of 4 elements in Cladietum marisci to be of the order Ca > K > Mg = Na.--Copyright 1973, Biological Abstracts, Inc.
W74-13037

THE SIGNIFICANCE OF SUMP-PONDS IN HARVESTING PADDY-FIELD FISHES IN NORTH KRIAN, PERAK.
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat.
For primary bibliographic entry see Field 8I.
W74-13039

THE EFFECT OF SUPPLEMENTARY ALGAL FEEDING OF A HATCHERY BREEDING STOCK OF OSTREA EDULIS L. ON LARVAL VIGOUR.
Ministry of Agriculture, Fisheries and Food, Conway (Wales). Fisheries Experiment Station.
For primary bibliographic entry see Field 8I.
W74-13042

JOJOBA: A WAX-PRODUCING SHRUB OF THE SONORAN DESERT, LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
W. C. Sherbrooke, and E. F. Haase.
Arid Lands Resource Information Paper No 5, 1974. 141 p. 2 maps, 256 ref. HEW-OS-74-20.

Descriptors: *Planting management, *Bibliographies, *Desert plants, *Systematics, Shrubs, *Southwest U.S., *Mexico, Reviews, Indian reservations.
Identifiers: *Jojoba, *Liquid wax, Plant substances, Seed production, Waxes.

This paper reviews the literature by displaying a computerized annotated bibliography on the desert shrub jojoba (Simmondsia chinensis) of the southwestern U.S. and northwestern Mexico. The shrub's biology and natural history are covered by discussions of its morphology, reproduction, habitat, genetics, systematics, evolution, Ethnobotany, and uses. Utilization of the plant's wax as a whale oil substitute, sulfurization, hydrogenation, acids, alcohols and esters, modern medicinal uses, patents, extraction, and use of meal are described. Native and cultivated plantations, and plantation management are discussed. Current research activities in areas where the plant is both native and introduced are described. Special account is taken of the native American Indian industry based on the uses of the shrub that is developing in south-central Arizona on the San Carlos Indian Reservation; is hoped economic self development can be generated for this and other tribes in those regions where the plant is either found in its native state or where conditions are suitable for its cultivation. (Paylore-Arizona)
W74-13141

EFFECT OF DIFFERENT IRRIGATION METHODS ON THE ALFALFA CROPS IN RICE CROP ROTATIONS, (IN RUSSIAN),
N. S. Goryunov, and V. G. Bykov.
Dokl Vses Ord Lenina Adad S-KH Nauk Im V I Lenina. 10, p 41-42, 1972, Illus.
Identifiers: Alfalfa, Rice, *Irrigation effects.

Various methods of irrigation are discussed with respect to their effect on the alfalfa crops. Under the specific conditions of South Kazakhstan, USSR, the basin method of irrigation is not recommended in view of the considerable damage to alfalfa plants.--Copyright 1973, Biological Abstracts, Inc.
W74-13172

QUANTITATIVE AND HISTORICAL EVIDENCE OF VEGETATION CHANGES ALONG THE UPPER GILA RIVER, ARIZONA,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 3B.
W74-13174

PRIMARY PRODUCTIVITY OF CROP FIELDS, (IN POLISH),
Polish Academy of Sciences, Koscian. Inst. of Ecology.
C. Kukielska.
Bull Acad Pol Sci Ser Sci Biol. Vol 21, No 2, p 109-115, 1973, Illus.
Identifiers: *Potatoes, Rainfall, *Rye.

The primary productivity of rye and potato fields differently fertilized and cultivated for several seasons under different temperature and rainfall conditions indicated that the total primary production of crops studied in Wielkopolska (Poland) approximates 1 kg dry weight/ sq m exceeding this value only in the years of facorable moisture conditions at the critical period for crop development. The crop biomass effects the weed biomass; more luxuriant growth of crops inhibits the growth of weeds. The moisture conditions affect through a crop plant the structure and value of the total primary productivity of both rye and potato fields.--Copyright 1973, Biological Abstracts, Inc.
W74-13270

PLANTS AS INDICATORS OF HYDROLOGY AND LITHOLOGY IN THE ILI ANCIENT DELTA AREA, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-13283

THE OAK FOREST MIXED WITH BISTORT OF THE ARDENNES (POLYGONO BISTORTAE-QUERCETUM ROBORIS), (IN FRENCH),
N. Sougnez.
Bull Jard Bot Natl Belg. Vol 43, No 1/2, p 37-81. 1973. Illus.

Descriptors: *Oak trees, Forests, Succession, Alder trees, Ash trees.
Identifiers: Ardennes, *Belgium.

The bistort-oak forests of the Belgian Ardennes form mixed populations, generally treated as underbrush in timber. Half of the association tables are derived from populations so treated. Simple copses are less frequent (30%) of the charted species, while simple timber comprises only 20% of the collections. Generally one finds in the arboreal stratum a clear predominance of the pedunculate oak (Quercus robur), except for the more fertile alluvial areas where it shares the area with the sycamore maple and the ash (Fraxinus) tree. Alder (Alnus) trees seem to be little influenced by the fertility of the soil but depend more on the depth of the water table and the frequency of floods. A major chapter is devoted to the floristic organization, followed by a table of associations comprising 66 units under 3 main subassociations. The subdivisions of the association are then discussed

in detail, with areas of distribution, geologic formations, role of altitude, and soil characteristics.--Copyright 1974, Biological Abstracts, Inc.
W74-13301

POLYPHENOLS OF COTTON LEAVES AND THE EFFECT ON THEIR COMPOSITION OF WATER AND NUTRITIONAL STRESS (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre d'Adiopodoume.
For primary bibliographic entry see Field 3F.
W74-13344

GUIDELINES FOR RESEARCH ON WATER REQUIREMENTS OF CROPS,
Institute for Applied Research on Natural Resources, Bagdad (Iraq).
For primary bibliographic entry see Field 3F.
W74-13345

THE RESPONSE OF A GLASSHOUSE TO HIGH SOLAR RADIATION AND AMBIENT TEMPERATURE,
Commonwealth Scientific and Industrial Research Organization, Griffith, (Australia). Div. of Irrigation Research.
K. Garzoli, and J. Blackwell.
Journal of Agricultural Engineering Research, Vol 18, No 3, p 205-216, September, 1973. 6 fig, 28 ref.

Descriptors: *Australia, *Greenhouses, *Plant growth, *Solar radiation, Energy transfer, Estimating equations, Semiarid climates, Temperature, Air environment, Soil-water-plant relationships, Soil environment, Structural engineering, Temperature control, Ventilation.
Identifiers: *Glasshouses.

In a semi-arid area of Australia, at inland Griffith, a series of experiments was conducted to study the response of a glasshouse climate to high solar radiation and ambient temperatures. Theoretical calculations were used to describe the energy transfer processes that took place within the single-span glasshouse and between the glasshouse and the outside climate. Using instruments readily available, experimental results demonstrated that it is possible to plot the energy balance of a glasshouse with reasonable surety - designed here to achieve about 5% overall accuracy. The measurements showed most of the heat generated within the glasshouse under conditions of such solar radiation and ambient temperature was used to increase the total heat (heat content) of the air. Very large ventilation areas were necessary to assure reasonable glasshouse temperatures. Inside the glasshouse the amount of heat from solar radiation conducted into the soil was measured to be about 8%. Thus, proper design of glasshouses for plant culture necessitates a thorough understanding if the glasshouse response in a prevailing climate in order to assure good plant growth and production. (Gloyd-Arizona)
W74-13347

EFFECT OF DROUGHT ON THE NUCLEIC ACID CONTENT IN WINTER WHEAT, (IN UKRAINIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
S. I. Slukhai, and K. S. Tkachuk.
Dopov Akad Nauk Ukr Rsr Ser B Heol Heofiz Khim Biol, Vol 34, No 12, p 1124-1127, 1972. English summary.
Identifiers: DNA, *Drought, Nucleic acids, RNA, Wheat.

The decrease in nucleic acid content was observed immediately after drought started. Under conditions of soil moisture deficiency (35-40% of total moisture-holding capacity) the RNA and DNA contents in wheat leaves increase; this is probably a result of plant adaptation to the unfavorable humidity conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-13352

FOOD AND FEEDING HABITS OF MAHASEER, TOR TOR (HAMILTON),
Punjab Agricultural Univ., Ludhiana (India). Dept. of Zoology Entomology.
P. Sehgal.
Res Bull Panjab Univ Sci, Vol 22, No 1/2, p 253, 1971.
Identifiers: Algae, Diatoms, *Mahaseer, Mollusks, *Fish diets, Sport fish.

Mahaseers are important as sport and table fish. The food and feeding habits of this important fish were studied. Crustaceans formed the dominant item of diet, followed by algae, diatoms and mollusks.--Copyright 1973, Biological Abstracts, Inc.
W74-13369

FISH NUTRITION.
Academic Press: New York, N.Y., London, England, 1972, 713 p, Illus, J.E. Halver, editor. Pr $32.50.
Identifiers: *Fish nutrition, Publications.

The latest information is presented on the basic nutritional requirements of fish reared in tanks, streams and ponds. The types of food used to rear fish are discussed, and all that is now known-and that remains to be known-to develop productive fish husbandry throughout the world. It discusses qualitative and quantitative requirements for essential and non-essential amino acids, crystalline vitamins, essential fatty acids, carbohydrate sources and general nutrient balance. Also discussed is the availability and utilization of dietary ingredients and methods for calculating chemical and nutritional contents of diets, and the role of nutrition in fish diseases discussed from the clinical as well as the histological viewpoint. Other topics covered included specific effects of adventitious toxins in the food supply, and diets and techniques used throughout the world to rear different species of fish. An extensive list of references is included at the end of each chapter which will enable readers to keep up to date on current activities in basic and applied fish nutrition research. The book will be of interest to students and teachers in the field of nutrition, natural resources, conservation and toxicology, as well as researchers in these fields.--Copyright 1973, Biological Abstracts, Inc.
W74-13375

PROLONGED AFTERGLOW OF STRAWBERRY LEAVES AT VARIOUS LEVELS OF HYDRATION, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
T. V. Veselova, V. A. Veselovskii, V. V. Grinenko, V. S. Marenkov, and Yu. S. Pospelova.
Fiziol Rast, Vol 20, No 2, p 229-232, 1973, Illus. English summary.
Identifiers: Fragaria, Leaves, *Strawberry, *Dehydration.

The effect of soil drought and direct dehydration of the leaves was studied in 2 strawberry cultivars, 'Chernobrivka' and 'Mize', (Fragaria grandiflora) with different tolerance to water deficiency. Prolonged afterglow was found to undergo 2-phase changes in the course of dehydration. These changes of afterglow were more pronounced and occurred at less dehydration in the case of soil drought. Afterglow in the plants during dehydration differed among the cultivars.--Copyright 1973, Biological Abstracts, Inc.
W74-13378

ELABORATION OF OPTIMAL DOSES AND FORMS OF MACRO- AND MICROELEMENTS AND HUMATES IN THE NUTRIENT USED IN HYDROPONIC CULTURE'WROCLAW,'
Wroclaw Univ. (Poland). Inst. of Botany and Biochemistry.
For primary bibliographic entry see Field 3F.
W74-13380

THE WATER REGIME OF FLOWERS, (IN RUSSIAN),
Ryazanskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
For primary bibliographic entry see Field 2D.
W74-13381

THE EFFECT OF WATER-SALT REGIME OF SOIL ON THE GROWTH OF QUERCUS ROBUR, (IN BYCLORUSSIAN),
For primary bibliographic entry see Field 3C.
W74-13393

INFLUENCE OF THE PARTIAL PRESSURE OF OXYGEN UPON THE RATE OF STOMATAL OPENING AND CLOSING VELOCITY OF PELARGONIUM X HORTORUM IN DARKNESS (IN FRENCH),
Paris-6 Univ. (France). Laboratoire de Physiologie Vegetale Appliquee.
P. Louguet.
Physiol Veg. Vol 10, No 3, p 515-528. 1972. Illus. (English summary).
Identifiers: *Oxygen, *Pelargonium, Pressure, *Stomata.

The effect of O2 deprivation is a complete inhibition of opening and closing movements, which are normally induced in the presence of O2 by variations of the content of CO2 in darkness. A release of this inhibition is obtained as soon as O2 is provided, even under a slight partial pressure (0.005-0.01%). However, the influence of partial pressures O2 between this threshold and 0.2-0.3% is not identical with regard both to the speed of opening and closing, indicating that the mechanisms of opening and closing are different.--Copyright 1973, Biological Abstracts, Inc.
W74-13404

GROWTH OF CROP ROOTS IN RELATION TO SOIL MOISTURE EXTRACTION,
Brooms' Barn Experiment Station, Bury St. Edmonds, (England).
For primary bibliographic entry see Field 3F.
W74-13414

FUNGI IN THE DIET OF GAMMARUS PSEUDOLIMNAEUS (AMPHIPODA),
Waterloo Univ. (Ontario). Dept. of Biology.
F. Barlocher, and B. Kendrick.
Oikos. Vol 24, No 2, p 295-300. 1973.

Descriptors: *Fungi, Invertebrates, Leaves.
Identifiers: *Gammarus pseudolimnaeus.

Autumn-shed leaves which support a rich fungal population are an important source of food for many stream invertebrates. Two experiments were conducted to elucidate the relative importance of fungi and leaf substance in the nourishment of Gammarus pseudolimnaeus. Mycelium of Tricladium angulatum proved to be a much better source of food for adult Gammarus than maple leaves with rich microbial growth. The weight increases of young Gammarus were compared when they could feel exclusively either on maple or elm leaves or on mycelia of 1 of 10 fungi isolated from leaves in streams. The daily consumption of dry substance was about 10 times higher in leaf diets than in fungal diets, but the largest weight increase were found in animals feeding on 4 of the fungi. Two of the fungi were clearly unsuitable as the sole source of food. Elm and maple leaves and the other 4 fungi fell between these extremes.--Copyright 1974, Biological Abstracts, Inc.
W74-13484

COMPARISON OF RATES OF FEEDING AND BIODEPOSITION OF THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA GMELIN, FED DIFFERENT SPECIES OF PHYTOPLANKTON,
Woods Hole Oceanographic Institution, Mass.
K. R. Tenore, and W. M. Dunstan.
J Exp Mar Biol Ecol. Vol 12, No 1, p 19-26. 1973.

Descriptors: *Oysters, *Fish food organisms, *Phytoplankton, *Fish diets.
Identifiers: *American oyster, Crassostrea virginica.

The feeding and biodeposition rates of small (2.4 cm) and large (5.2 cm) Crassostrea virginica were differently affected in experiments using flowing systems by moderate (292 microgram C/l sea water) and high (487 microgram C/l sea water) concentrations of the following phytoplankton: the diatoms Thalassiosira pseudonana (Cyclotella nana), Skeletonoma costatum, Nitzschia closterium, and the green alga, Dunaliella tertiolecta. The average feeding rate of the oysters on the different phytoplankton was: Dunaliella < Nitzschia < Skeletonema < Thalassiosira. In contrast, oysters fed on Thalassiosira had the lowest rate of biodeposition (1.626 X 10 to the third power g ash-free dry weight/g dry flesh weight per day) but oysters cultured on Nitzschia showed the highest rate of biodesposition (2.952 X 10 to the minus 2 power units). The response of the feeding rate of the 2 sizes of oysters to food concentration differed according to the algal food source. Oysters fed on; Thalassiosira and Skeletonema exhibited a higher feeding rate at a higher food level; in contrast, oysters fed on Nitzschia showed no significant differences and those cultured on Dunaliella a depressed feeding rate at the higher food concentration. No differences were observed in feeding rate between small and large osyters fed on Skeletonema and Dunaliella, but small oysters had a higher feeding rate than large oysters when cultured on Thalassiosira and a lower feeding rate when fed on Nitzschia. The smaller size of Thalassiosira and larger size of Nitzschia might account for these differences in the feeding efficiency of small oysgers. The biodeposition rates of both sizes of oysters were also affected by food concentration of the different algae. At the high food concentration with Skeletonema, Nitzschia, and Dunaliella, all oysters showed a marked increase in the rate of biodeposition, but oysters fed on Thalassiosira exhibited no great change. On all species of phytoplankton, the larger oysters produced greater biodeposition than the small oysters.--Copyright 1974, Biological Abastract, Inc.
W74-13490

PLANT POPULATION AND HUMIDITY RELATIONSHIPS IN GRASSLAND: THE QUESTION OF EVALUATING POPULATION SAMPLES, (IN GERMAN),
F. Wacker.
Z Acker- Pflanzenbau, Vol 137, No 2, p 131-143, 1973. English summary.

Descriptors: *Plant populations, *Grasslands, Humidity.

The advantages and disadvantages of the methods of Ellenberg, Klapp and Wittmann for assessing the residual moisture of the habitat of grassland populations from a given plant population are discussed. An attempt is made to show some way in which one can arrive at a balanced and detailed judgment of the humidity of the habitat by taking into consideration the indicator value and the dominance (as a proportion of the yield) of all the plants represented in the population and the mean humidity value. Attention is drawn to the necessity of verifying the humidity values and of comparative investigations between the plant population and the humidity of the habitat.--Copyright 1974, Biological Abstracts, Inc.
W74-13491

EFFECTS OF LOW SOIL TEMPERATURE ON TRANSPIRATION, PHOTOSYNTHESIS, LEAF RELATIVE WATER CONTENT, AND GROWTH AMONG ELEVATIONALLY DIVERSE PLANT POPULATIONS,
For primary bibliographic entry see Field 2D.
W74-13492

FOOD HABITS OF THE MOUNTAIN WHITEFISH, PROSOPIUM WILLIAMSONI (GIRARD),
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
R. W. Pontius, and M. Parker.
Trans Am Fish Soc. Vol 102, N)<, No 4, p 764-773, 1973. Illus.

Descriptors: *Fish behavior, *Fish food organisms, *Wyoming, Fish diets.
Identifiers: Prosopium williamsoni, *Whitefish, *Snake River(Wyo).

Organisms eaten by mountain whitefish in the Snake River, Wyoming, were analyzed. Abundance of an organism in a whitefish stomach is dependent upon the organism's availability. The stomach contents in all size classes differed in taxonomic composition. Overlap in the taxonomic categories of food organisms eaten by fish of size classes II and III was about 50%. Larger fish were more generalized feeders and could utilize a greater size range of prey organisms than smaller fish. This was reflected in the increase of food length diversity (FLD) and food taxa diversity (FTD) with increasing fish size. FTD was correlated most closely with the taxonomic richness of stomach contents rather than relative abundance of items in each taxonomic category. Counting the taxa in stomachs gave some measure of FTD. Choices concerning the type of food eaten (species richness component of diversity) are most important in affecting FTD. Comparison of stomach contents with drift and bottom samples showed that fish could not have fed randomly solely from the drift or bottom. Morphology of the whitefish and the occurrence of sand and gravel in stomachs are in indication of bottom feeding.--Copyright 1974, Biological Abstracts, Inc.
W74-13497

2J. Erosion and Sedimentation

THE FIELD STUDY OF SAND MOTION THROUGH POROUS MEDIUM BY MEANS OF LUMINOPHORS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Baku (USSR).
Yu. A. Ibad-Zade, and B. S. Shteinman.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol 1, p 118-123, 1972. 3 fig, 2 ref.

Descriptors: *Bed load, *Porous media, *Alluvial channels, Sands, Sediment transport, Alluvium, Tracers, Fluorescent dye, Tracking techniques, Boreholes.
Identifiers: *USSR(Terek River).

Sand motion under the channels of the Caucasian rivers was studied using dyed sand grains. Boreholes penetrating into the soil under the channel were used. To catch the travelling sand in different zones of soil, special tube traps divided into horizontal cells were placed inside the boreholes. Although the velocities of sand motion under the bed are small, total volume may be appreciable due to the considerable depth of the travelling sand: for example, in one of the experiments on the river Terek about 170 tons/day of sand were displaced through the section. (See also W74-12811) (Knapp-USGS)
W74-12817

COUPLING BETWEEN TRANSPORT PROCESSES IN AN ANISOTROPIC MIXTURE OF FLUIDS AND SOLID PARTICLES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
P. H. Groenevelt, and G. H. Bolt.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 653-666, 1972. 11 ref.

Descriptors: *Flow, *Suspension, *Clays, *Slurries, Suspended load, Membrane processes, Sediment transport, Soil water movement, Unsaturated flow, Groundwater movement.

In a mixture of solid particles and fluids, for instance a clay-water-air mixture, the load stress and some of the 'peculiar' stresses may have to be described by second order tensors. The peculiar stresses provide the tools for a continuum-mechanical treatment of the dynamics of the system. This treatment is compared with a thermodynamic treatment for which the usefulness of the concept of chemical potential tensors is discussed. Constitutive equations are proposed for flow processes of and within a clay-salt-water-air mixture. These equations describe the effects of coupling between the transport processes in a macroscopically anisotropic mixture of fluids and solid particles. (See also W74-12811) (Knapp-USGS)
W74-12849

OCCURRENCE AND DISTRIBUTION OF CLAY MINERALS AND TRACE METALS IN THE BOTTOM SEDIMENT OF BILOXI BAY, MISSISSIPPI,
Mississippi Univ., University. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 2L.
W74-12860

COMPONENT DESCRIPTION OF SEDIMENT-WATER MICROCOSMS,
Utah State Univ., Logan. Center for Water Resources Research.
For primary bibliographic entry see Field 5C.
W74-12868

TOXIC METALS IN LAKE AND RIVER SEDIMENTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-12909

THE RECENT SEDIMENTS OF WINDERMERE,
Leicester Univ. (England). Botany Lab.
W. Pennington.
Freshwater Biol. Vol 3, No 4, p 363-382. 1973. Illus.

Descriptors: *Sediments, *Analysis, Mud, Analytical techniques, Lakes, *Sedimentation rates, Movement.
Identifiers: *United Kingdom(Windermere).

Recent analyses of the topmost 30 cm of sediment in Windermere (United Kingdom) are presented. These confirm and expand earlier work on the nature and interpretation of the change in sediment type now found 27 cm below the mud surface. The results of 4 different methods of estimation of the present rate of sediment accumulation are compared and agree on a figure between 2 and 3 mm/yr. Explanations which involve environmental changes either on the catchment or in the lake are put forward to account for the difference between this figure and the mean postglacial rate of 0.3-0.5 mm/yr.--Copyright 1974, Biological Abstracts, Inc.
W74-12931

PREDICTING SEDIMENT YIELD FROM CLIMATE AND TOPOGRAPHY,
Agricultural Univ., Wageningen (Netherlands).
J. M. L. Jansen, and R. B. Painter.
Journal of Hydrology, Vol 21, No 4, p 371-380, 1974. 2 fig, 4 tab, 15 ref.

Descriptors: *Sedimentation rates, *Sediment yield, *Regression analysis, Optimization, Climatic zones, Topography, Soil conservation, Watersheds(Basins), Erosion, Mathematical models, Mathematical studies, Statistical methods, Rivers, Yield equations.
Identifiers: Worldwide, Global denudation, Linear regression models.

Linear regression models relating annual average sediment yield with a number of climatic and topographic variables were developed for rivers (basin area greater than 5000 sq km) in each of the world's major climatic zones. The models were of value as a predictive tool to assess the scale of the sediment problem in rivers where no sediment data exist. Despite the limitations imposed by the use of numerical optimisation in their development, the relative significance of different climatic and topographic factors was demonstrated, and an estimate of the annual global denudation, based on the equations, compared satisfactorily with existing figures. (Terstriep-ISWS)
W74-13002

METHYLMERCURY: BACTERIAL DEGRADATION IN LAKE SEDIMENTS.
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W74-13038

THE MERCURY CONTENT OF SEDIMENTS FROM TWO LAKES IN DALARNA, SWEDEN,
Uppsala Univ. (Sweden). Dept. of Quaternary Geology.
I. Fredriksson, and U. Qvarfort.
Geol Foren Stockh Forh. 95(2): 237-242, Illus, 1973.

Descriptors: Europe, *Sediments, Mercury, Lakes, Lake sediments.
Identifiers: Dalarna, Picea, Pike, Sweden.

Data are given on the Hg content of sediment samples from 2 lakes situated in an area not influenced by industrial pollution. In one of the lakes, pike were found with a high Hg content. To date the sediments, the increase of the frequency of the Picea pollen is used. The Hg content of the sediments is quite constant and has in part been fairly high for at least the last 3000 yr.--Copyright 1974, Biological Abstracts, Inc.
W74-13040

UNIT STREAM POWER FOR SEDIMENT TRANSPORT IN NATURAL WATERS.
Illinois State Water Survey, Urbana.
C. T. Yang, and J. B. Stall.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 415 $3.75 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 88, July 1974. 38 p, 32 ref, 27 tab. OWRT B-075-ILL(1), 14-31-0001-3881.

Descriptors: Rivers, *Sediment transport, Hydraulics, Open channel flow, Energy equation, Equations, Movement, Alluvial channels, Flumes, Fluid mechanics, Boundary layers.
Identifiers: Incipient motion, *Unit stream power.

The relationship between rate of sediment transport and rate of potential energy expenditure has been studied. Unit stream power, defined as the time rate of potential energy expenditure per unit weight of water, is shown to be the dominant factor in the determination of total sediment concentration. Basic concepts in fluid mechanics and boundary layer theory are used to establish the flow condition in incipient motion. Two equations that provide simple and direct criteria for incipient motion are found. These equations are verified by 153 sets of data independently collected by eight investigators. A dimensionless unit stream power equation is found for the prediction of total sediment concentration for both laboratory flumes and natural rivers. This equation not only provides a good estimation of the total sediment concentration in an alluvial channel but also correctly reflects the effects of the variations of particle size, water depth, and water temperature on total sediment concentration. Data collected from six natural rivers and more than one thousand sets of laboratory data are used in supporting this equation. Data collected from 17 regular gaging stations on natural rivers also indicate that unit stream power dominates the rate of sediment transport.
W74-13049

DEPOSITION OF RIVER SILTS IN THE RHINE AND MEUSE DELTA,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
For primary bibliographic entry see Field 5B.
W74-13155

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W74-13178

HYDROGEOLOGIC ASPECTS OF STRUCTURAL DEFORMATION IN THE NORTHERN GULF OF MEXICO BASIN,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 2F.
W74-13179

AERIAL OBSERVATIONS OF SUSPENDED-SEDIMENT PLUMES IN SAN FRANCISCO BAY AND THE ADJACENT PACIFIC OCEAN,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W74-13180

CHERT DERIVED FROM MAGADIITE IN A LACUSTRINE DEPOSIT NEAR ROME, MALHEUR COUNTY, OREGON,
Geological Survey, Denver, Colo.
R. A. Sheppard, and A. J. Gude, III.
Journal of Research, US Geological Survey, Vol 2, No 5, p 625-630, September-October, 1974. 7 fig, 12 ref.

Descriptors: *Chert, *Bottom sediments, *Diagenesis, *Mineralogy, Sedimentary rocks, Silica, Silicates, Chemical precipitation, *Oregon.
Identifiers: *Magadiite, Rome(Ore).

Nodules and thin beds of chert occur in the upper part of the informally named Rome beds, about 8-11 km southwest of Rome, Oregon. The chert is in green to gray mudstone, about 8 m beneath a conspicuous gray and yellow zeolite tuff. The bedded chert contains molds of saline minerals, and it grades southward and marginward into nodular chert. The nodular chert is of two varieties: relatively large lobate nodules that have greenish-brown interiors and abundant saline crystal molds, and relatively small lobate nodules that have gray interiors and a surface reticulation. The latter variety is the so-called snakeskin agate prized by lapidaries. Both nodular varieties characteristically have a thin white rind. The cherts are similar, if not identical, to cherts reported from Quaternary lacustrine deposits in eastern Africa and from Pleistocene to Jurassic lacustrine deposits in Wyoming. The Rome chert probably formed from a hydrous sodium silicate precursor such as magadiite during diagenesis. Magadiite is generally a primary precipitate from a highly alkaline lake which is capable of attaining a high concentration of silica in solution. (Knapp-USGS)
W74-13184

CHANGES IN SEDIMENT LOADS IN RIVERS OF THE ATLANTIC DRAINAGE OF THE UNITED STATES SINCE 1900,
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 5B.
W74-13215

SEDIMENTATIONAL REGIMES OF THE YORK RIVER, SOUTHEASTERN VIRGINIA, AS SHOWN BY MASS PROPERTIES,
Lafayette Coll., Easton, Pa. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-13473

2K. Chemical Processes

CALCIUM CARBONATE EQUILIBRIA IN SOILS AND IN IRRIGATION WATERS,
New Mexico State Univ., Las Cruces. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W74-12862

DEPOLARIZED RAYLEIGH SCATTERING AND HYDROGEN BONDING IN LIQUID WATER,
Catholic Univ. of America, Washington, D.C.
For primary bibliographic entry see Field 1A.
W74-12922

STUDY OF THE STRUCTURE OF MOLECULAR COMPLEXES. VI. DIMERS AND SMALL CLUSTERS OF WATER MOLECULES IN THE HARTREE-FOCK APPROXIMATION,
IBM Research Lab., San Jose, Calif.
For primary bibliographic entry see Field 1A.
W74-12923

THE CHEMICAL COMPOSITION AND FLOW OF THE RIVER FROME AND ITS MAIN TRIBUTARIES,
Freshwater Biological Association, Wareham (England). River Lab.
H. Casey, and P. V. R. Newton.
Freshwater Biol. Vol 3, No 4, p 317-333. 1973. Illus.

Descriptors: *Rivers, *Chemical analysis, Alkalinity, Calcium, Magnesium, Sodium, Potassium, Phosphates, Nitrates, Biota, Snowmelt.
Identifiers: *United Kingdom(Frome River).

Weekly measurements of chemical composition were made at 16 sampling points on the River Frome (United Kingdom) and its main tributaries from Oct. 1970 - Dec. 1971. At 14 of these points stream discharge was measured. Water samples from each sampling point were analyzed for alkalinity, Ca, Mg, Na, K, pH, conductivity, reactive phosphate and nitrate. Mg varied little in concentration; alkalinity and Ca concentrations decreased in time of flood. The highest concentration of Na occurred after snow had melted from salted roads; otherwise it showed little variation. The highest values for nitrate N were at peak flows but otherwise it altered little. P and K varied most and both showed a reduction between Feb. and May. These results are part of a survey of the chemical composition of the waters of rivers in the south of England. This survey is aimed at providing a picture of the chemical environment of the rivers as a background for ecological work on the biota and to investigate the factors influencing variations in chemical composition. A preliminary paper described the flow and chemistry at 1 point

(East Stoke) on the lower part of the river. The contribution each main source makes to the flow and chemistry of the whole river is reported herein.--Copyright 1974, Biological Abstracts, Inc.
W74-12928

DETERMINATION OF ORGANIC ACIDS OF LOW RELATIVE MOLECULAR MASS (C-1 TO C-4) IN DILUTE AQUEOUS SOLUTION,
Swedish Forest Products Research Lab., Stockholm.
For primary bibliographic entry see Field 5A.
W74-12929

HYDROCARBON COMPONENTS TO FLOATING OIL POLLUTANTS OF SEA WATER, (IN JAPANESE),
Shimadzu Seisakusho Ltd., Tokyo (Japan). Tokyo Research Lab.
For primary bibliographic entry see Field 5A.
W74-13075

A DIRECT ESTIMATION OF MICROGRAM AMOUNTS OF AMMONIA IN WATER WITHOUT SALT-ERROR,
Tokyo Univ. (Japan). Fisheries Inst.
For primary bibliographic entry see Field 5A.
W74-13084

AN INVESTIGATION OF THE MINERALOGY AND PETROGRAPHY OF URANIUM-BEARING SHALES,
Pennsylvania State Univ., University Park. Dept. of Mineralogy and Petrography.
T. F. Bates.
Available from NTIS, Springfield, Va 22161 as NYO-9605, $4.25/copy, $2.25/microfiche. Report No NYO-9605, August 1961. 58 p, 1 fig, 4 tab, 20 ref, 3 append.

Descriptors: *Research and development, *Mineralogy, *Petrography, Geology, *Uranium, *Shales, Chemical analysis, Data collections, Geographical regions, Trace elements, Rocks.

Ten years of research work is summarized on the mineralogy and petrology of certain black shales of particular interest because of significant concentrations of uranium. The main objectives of the investigation were: (1) to obtain a large amount of precise mineralogical, petrographic and chemical data on many samples of black shale representative of various geologic periods, geographic localities and degree of uranium concentration; (2) to analyze and define the interrelationship between the numerous measured variables with respect to differences between geologic and geographic units within each shale studied, and differences between shales; and (3) to interpret the results in the light of present concepts with the hope of adding new information in such areas as: the mineralogical and chemical nature of black shales, the relationship of uranium and other trace elements to the major constituents and to the petrographic characteristics of the rocks, the interrelationships of organic and inorganic matter, and the geological conditions which lead to the formation of these rocks and the concentration of uranium in them. (Houser-ORNL)
W74-13116

DETERMINATION OF CHEMICAL OXYGEN DEMAND INDICES IN WATER, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W74-13130

QUALITY OF GROUND WATER IN BIKANER DISTRICT OF WESTERN RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 4B.
W74-13151

APPLICATION OF RED-LEAD TO THE DETECTION OF DISSOLVED SULFIDE IN WATERLOGGED SOILS,
Universidade Federal da Bahia, Salvador (Brazil). Inst. of Geosciences.
For primary bibliographic entry see Field 2G.
W74-13161

REGIONAL FLOW SYSTEM AND GROUNDWATER QUALITY IN WESTERN OHIO,
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 4B.
W74-13181

CHERT DERIVED FROM MAGADIITE IN A LACUSTRINE DEPOSIT NEAR ROME, MALHEUR COUNTY, OREGON,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2J.
W74-13184

EFFECTS OF RAINFALL AND DIFFERENTIAL APPLICATION OF N, P, K AND CA ON THE DOWNWARD MOVEMENT OF K IN AN AVALON MEDIUM SANDY LOAM CROPPED WITH MAIZE (ZEA MAYS L.),
Agricultural Research Inst., Cedara (South Africa).
For primary bibliographic entry see Field 2G.
W74-13251

TEMPERATURE-CONTROLLED FLUID MANIFOLD FOR A FLUID SYSTEM OF AN AUTOMATED SAMPLE ANALYZER,
Technicon Instruments Corp., Tarrytown, N.Y. (assignee)
For primary bibliographic entry see Field 7B.
W74-13258

DETECTION OF DILUTE ORGANIC ACIDS IN WATER BY INELASTIC TUNNELING SPECTROSCOPY,
Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
For primary bibliographic entry see Field 5A.
W74-13304

DATA ON THE HYDROBIOLOGICAL STATUS OF THE BODROG RIVER BACKWATER AT SAROSPATAK: II. HYDROCHEMISTRY,
Wasser-Kanalis. Kamitats Hajdu-Bihar, Debrecen (Hungary).
I. Devai, G. Devai, A. Szabo, K. Horvath, and I. Bansci.
Acta Biol Debrecina, 9, p 177-186, 1971.
Identifiers: *Carbon dioxide, *Oxygen, *Water chemistry, *Hungary(Bodrog River).

The dissolved O2, free CO2, P, NO3, as well as K, Na, Mg, Ca, hydrocarbonate, sulfate ions levels and pH values of stagnant waters in the Bodrog river flood plain area (backwaters of Bodrog and other water bodies) at Sarospatak (Hungary) were studied. Like the water of Bodrog river, the waters of the backwards pertain to the beta-limno, Ca-HCO3 type. The different backwaters can be positively classified according to their O2 demands, Fe contents, and 02-CO2 cycles, which is most probably due to the differences in the intensity, nature and relations of synthetic and lytic processes.--Copyright 1973, Biological Abstracts, Inc.
W74-13385

HYDROECOLOGICAL STUDIES OF THE WATER BODIES OF THE BUKK AND ZEMPLEN MOUNTAINS: II,
Lajos Kossuth Univ., Debrecen (Hungary). Zoological Inst.
J. Szabo, G. Devai, K. Horvath, and I. Devai.
Acta Biol Debrecina, 9, p 187-195, 1971.
Identifiers: *Hungary, Organisms, *Spring waters, *Carbon dioxide, Montane regions.

The free CO2 content of spring and creek waters of the Bukk and Zemplen Mountains in Northeastern Hungary was studied. The free CO2 content of spring water, dependent of the volume of the caves from which such springs collect their water, was high and relatively steady. The free CO2 level in creek water was consequently considerably lower than that of spring water, and was influenced by such factors as solar irradiation, the abundance of aquatic microorganisms, and the water pH value.--Copyright 1973, Biological Abstracts, Inc.
W74-13388

DETERMINATION OF URANIUM IN NATURAL WATERS AFTER ANION-EXCHANGE SEPARATION,
Vienna Univ. (Austria). Analsches Institut.
For primary bibliographic entry see Field 5A.
W74-13416

STRUCTURE OF LIQUID WATER. STATISTICAL THERMODYNAMIC THEORY,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 1A.
W74-13417

STRUCTURE OF LIQUID WATER. II. IMPROVED STATISTICAL THERMODYNAMIC TREATMENT AND IMPLICATIONS OF A CLUSTER MODEL,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 1A.
W74-13418

RAMAN SPECTRA AND STRUCTURE OF WATER FROM -10 TO 90 (DEGREES C),
Regional Research Lab. Agricultural Research Service, Berkeley, Calif.
For primary bibliographic entry see Field 1A.
W74-13419

INVESTIGATIONS ON THE CATION-CONTENT IN A BOG: I. DIFFERENCES IN THE VEGETATION-COMPLEXES, (IN GERMAN),
Frankfurt Univ. (West Germany). Botanical Inst.
For primary bibliographic entry see Field 2H.
W74-13470

INVESTIGATIONS ON THE CATION-CONTENT IN A BOG: II. SEASONAL CHANGES AND INFLUENCE OF THE SPHAGNUM VEGETATION, (IN GERMAN),
Frankfurt Univ., (West Germany). Botanical Inst.
For primary bibliographic entry see Field 2H.
W74-13471

2L. Estuaries

POLLUTION MANAGEMENT IN THE COASTAL STATES,
Coastal States Organization, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W74-12767

SOUTH CAROLINA'S NEW MARINE RESOURCES CENTER,
South Carolina Wildlife Resources Dept., Charleston. Marine Research Lab.
E. B. Joseph.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 144-147.

Descriptors: *Education, *South Carolina, Water resources development, Comprehensive planning, Research and development, Water Resources Institute, *Research facilities, Organizations.
Identifiers: *Coastal zone management.

The design and mission of South Carolina's New Marine Resources Center are highlighted in this report. The Center's purpose is to bring about coordinated comprehensive management of the coastal zone in South Carolina, and to enhance the development of its resources in a manner consistent with the long term needs of the people. Activities of the center will include research, education, and advisory services in addition to management functions. The center will be located at Fort Johnson, Charleston Harbor, on 75 acres of highly desirable land. Included in the center's complex are over 20,000 square feet of laboratory space with environmentally controlled rooms and a walk in freezer and cooler in addition to the more traditional facilities. Architectural concepts of the center's design are depicted. The initial investment in facilities now under construction at the complex exceed $3 million, not including land costs. The original funding comes from the State of South Carolina and the Coastal Plains Regional Commission. (Schroeder-Wisconsin)
W74-12775

RELATIONSHIP BETWEEN THE HYDROLOGY, FLUID CHEMISTRY AND DIAGENETIC MINERAL FORMATION IN THE COASTAL AREAS OF THE PERSIAN GULF,
Ontario Water Resources Commission, Ottawa.
R. J. Patterson.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 683-698, 1972. 6 fig.

Descriptors: *Diagenesis, *Coastal plains, *Evaporation, Mineralogy, Water table, Groundwater movement, Sea water, Gypsum, Brines, Dolomite, Carbonates, Magnesium.
Identifiers: *Persian Gulf, *Sabkhas.

Sedimentary offlap and a relative fall in sea level have resulted in the development of broad, gently seaward sloping, planar areas, or sabkhas, along much of the south shore of the Persian Gulf. The water table beneath these areas always slopes seaward and is never more than 1 to 1-1/2 meters below the surface. When the water-table depth is in this range, the sabkha surface has achieved a state of deflational equilibrium. In the seaward areas, strong onshore winds drive thin sheets of seawater several kilometers inland. This seawater is concentrated by evaporation and then slowly infiltrates. Reaction between these brines and the carbonate sediments results in the formation of dolomite, magnesite and gypsum. In the landward region, continentally derived groundwaters move seaward. Evaporation through the thin sediment section above the water table causes the precipitation of gypsum and anhydrite. (See also W74-12811) (Knapp-USGS)
W74-12851

APPLICATION OF BOUNDARY-LAYER THEORY TO DISPERSION IN WELL-MIXED ESTUARIES,
Nielsen Engineering and Research, Inc., Mountain View, Calif.
For primary bibliographic entry see Field 5B.
W74-12858

OCCURRENCE AND DISTRIBUTION OF CLAY MINERALS AND TRACE METALS IN THE BOTTOM SEDIMENT OF BILOXI BAY, MISSISSIPPI,
Mississippi Univ., University. Dept. of Geology and Geological Engineering.
W. R. Reynolds, and D. A. Thompson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 291, $3.75 in paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report (1974). 41 p, 7 fig, 2 tab, 47 ref. OWRT A-073-MISS(1).

Descriptors: Estuaries, *Sediment transport, Clays, *Mississippi, Bays, Mineralogy, *Trace elements, *Metals, *Bottom sediments, *Clay minerals, Distribution patterns, Entropy, Mixing.
Identifiers: *Biloxi Bay(Miss), Trace metals.

Sixty-eight percent of the bottom sediment in the Biloxi Bay estuary system is 62 microns and less in size. The clay fraction of this predominant mud sediment type consists of 49% montmorillonite, 40% kaolinite and 11% illite with minor occurrences of vermiculite and sauconite. There is no distinct distribution pattern of any one of the clay mineral types. The two micron fraction of sample material from all stations contained nearly the same ratio of the dominant clay minerals. High entropy values obtained for each sample site indicate a thorough mixing of all the clay species. Mean concentrations of Cd, Pb, Ni and Co in the two micron fraction of bottom sediment are below 50 ppm whereas Cr is 120 ppm, Cu is 138 ppm and Zn is 130 ppm. Iron is concentrated on the average of 4.15 x 10,000 ppm. The values for Cr, Cu, Zn and Fe are greater than the average concentrations reported for soils and nearshore sediments. The bulk of these metals is probably introduced into the Biloxi Bay system from anthropogenic sources. Also, their high concentration is due to ion sorption and probably organic chelation. There is some indication of a possible inland movement of bottom sediment.
W74-12860

STORM SURGES IN THE BAY OF BENGAL,
Meteorological Office, New Delhi (India).
P. K. Das, M. C. Sinha, and V. Balasubramanyam.
Quarterly Journal of the Royal Meteorological Society, Vol 100, p 437-449, 1974. 5 fig, 4 tab, 15 ref.

Descriptors: *Storm surge, *Bays, *Waves(Water), *Tides, *Indian Ocean, Sea level, Shallow water, Coriolis force, Wind pressure, Coasts, Fluid friction, Model studies, Storms.
Identifiers: *Bay of Bengal, *Finite difference method, Bangladesh, Landfill, Tidal currents, Storm center.

Estimates of the surge generated by a model storm impinging on three coastal areas of the northern part of the Bay of Bengal were presented. A linear shallow-water long-wave model was used to evaluate the surge. A hydrostatic pressure distribution was assumed and external forces, such as atmospheric pressure, the Coriolis force, and frictional effects at the surface and the sea bed were included in the model. Surge amplitudes were computed for different values of storm intensity and speed with a finite difference scheme. The effect of the astronomical tide was estimated by specifying initial boundary conditions on the open boundary of the computational grid. For a devastating storm, which struck Bangladesh on November 12/13, 1970, it was shown that superposition of the surge on the tide resulted in overestimation of sea level at the time of landfall. (Bhowmik-ISWS)
W74-12985

THREE-DIMENSIONAL STRUCTURE OF STORM-GENERATED CURRENTS,
Shell Development Co., Houston, Tex.
G. Z. Forristall.
Journal of Geophysical Research, Vol 79, No 18, p 2721-2729, June 20, 1974. 9 fig, 13 ref, append.

Descriptors: *Storm surge, *Gulf of Mexico, *Mathematical models, *Analytical techniques, Hurricanes, Ocean currents, Coasts, Offshore platforms, Finite element analysis, Mathematical studies.
Identifiers: *Wind-generated currents, Three-dimensional flows, Current profiles.

Studies with a mixed numerical and analytical model showed it was possible to model three dimensional time-dependent currents by numerical integration over a two-dimensional grid followed by an evaluation of convolution integrals over the sea slope and wind stress. Using the model, it was observed that a tight circular wind system can spin up the water column to velocities much higher than those generated by a linear wind and that the outward flow at the surface was balanced by an inward flow near the bottom. Solutions for idealized cases were compared with analytical results, and a study of a hurricane in the Gulf of Mexico was presented. (Humphreys-ISWS)
W74-12992

SURFACE SHEAR WAVES,
Bristol Univ. (England). School of Mathematics.
For primary bibliographic entry see Field 8B.
W74-12994

CHEMICAL WATER TYPES AND THEIR DISTRIBUTION IN SPACE AND TIME IN THE AMSTERDAM DUNE-WATER CATCHMENT AREA WITH ARTIFICIAL RECHARGE,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 4B.
W74-13004

AN OBSERVATION OF RAPID THERMOCLINE FORMATION IN THE MIDDLE-ATLANTIC BIGHT,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5B.
W74-13005

STANDING WAVES ON BEACHES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
J. N. Suhayda.
Journal of Geophysical Research, Vol 79, No 21, p 3065-3071, July 20, 1974. 7 fig, 29 ref. ONR Contract N00014-69-A-0211-0003.

Descriptors: *Waves(Water), *Beaches, *Winds, *Shores, *Frequency analysis, Hydraulics, Fluid mechanics, Gravity waves, Sensors, Mexico, Pressure measuring instruments, Standing waves.
Identifiers: *Run-up, Spectra, Staff gages, Reflection coefficient, Edge waves, Bicoherence, Leaky mode, Standing waves, Mexico(El Moreno Beach-Baja-Calif), Density spectrum.

Simultaneous measurements of run-up spectra and nearshore wave spectra associated with standing waves were made on a natural beach at El Moreno, Baja California, Mexico. Digital wave staffs and bottom-mounted pressure sensors were placed in a line at various distances offshore from a digital run-up meter. The run-up meter measured the position of the edge of the water. To avoid the possible influence of nonlinear interactions on the spectra, bicoherence was estimated and the frequency range appropriate to a linearized model was defined. The cross-spectra phase angles between data records had values near zero or pi at frequencies of high coherence. The energy spectrum levels and the observed phase differences between records were in good agreement with the linear shallow water wave theory for standing waves on a plane beach. The general reflection coefficient for the data, estimated from the disagreement between data and standing wave theory, was approximately 0.7. (Bhowmik-ISWS)
W74-13006

MANGROVES AND COASTAL MORPHOLOGY IN CAIRNS BAY, NORTH QUEENSLAND,
Melbourne Univ., Parkville (Australia).
E. C. F. Bird.
J Trop Geogr. 35 p 11-16, 1972. Illus.

Descriptors: *Mangrove swamps, Marshes, Swamps, Forests, Australia, *Coasts, Salt marshes, *Geomorphology, Sedimentation.
Identifiers: Avicennia-marina, Cairns Bay, *North Queensland, Rhizophora, Succession.

Mangrove colonization has led to a reshaping of the upper part of the inter-tidal profile. Avicennia marina has particularly promoted accretion of sediment and it is suggested that mangroves with pneumatophores are more effective in trapping sediment than mangroves with prop-roots, such as Rhizophora. The succession from mangroves to swamp forest is interrupted in slightly drier areas by the development of salt marsh.--Copyright 1973, Biological Abstracts, Inc.
W74-13034

PCB CONTENTS IN MARINE ANIMALS IN TOKYO BAY, (IN JAPANESE),
Tokai Regional Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W74-13083

SOME HEAVY METALS IN SPRAT (SPRATTUS SPRATTUS) AND HERRING (CLUPEA HARENGUS) FROM THE INNER OSLOFJORD),
Oslo Univ. (Norway). Lab. for Marine Zoology and Marine Chemistry.
For primary bibliographic entry see Field 5C.
W74-13089

ACUTE TOXICOLOGY TO AN ESTUARINE TELEOST OF MIXTURES OF CADMIUM, COPPER AND ZINC SALTS,
National Marine Water Quality Lab., West Kingston, R.I.
For primary bibliographic entry see Field 5C.
W74-13101

DEPOSITION OF RIVER SILTS IN THE RHINE AND MEUSE DELTA,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
For primary bibliographic entry see Field 5B.
W74-13155

SOLUBILIZATION OF HYDROCARBONS BY THE DISSOLVED ORGANIC MATTER IN SEA WATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5D.
W74-13166

AVAILABILITY OF FRESH GROUND WATER IN NORTHEASTERN WORCESTER COUNTY, MARYLAND: WITH SPECIAL EMPHASIS ON THE OCEAN CITY AREA,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W74-13175

AN EVALUATION OF THE MAGOTHY AQUIFER IN THE ANNAPOLIS AREA, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W74-13176

HYDROGEOLOGIC ASPECTS OF STRUCTURAL DEFORMATION IN THE NORTHERN GULF OF MEXICO BASIN,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 2F.
W74-13179

AERIAL OBSERVATIONS OF SUSPENDED-SEDIMENT PLUMES IN SAN FRANCISCO BAY AND THE ADJACENT PACIFIC OCEAN,
Geological Survey, Menlo Park, Calif.
P. R. Carlson, and D. S. McCulloch.
Journal of Research, US Geological Survey, Vol 2, No 5, p 519-526, September-October, 1974. 14 fig, 7 ref.

Descriptors: *Sediment transport, *Suspended load, *Estuaries, *California, Aerial photography, Sedimentation, Path of pollutants, Turbidity, Salinity.
Identifiers: *San Francisco Bay.

Aerial observations of suspended-sediment patterns in the San Francisco Bay estuary system, together with shipboard water-property measurements, show that a plume of highly turbid, low-salinity waterassociated with the Sacramento-San Joaquin River system bifurcates in the central bay. During a winter storm period when Sacramento-San Joaquin discharge was about 7,800 cu m/s one lobe of the plume flowed 15 km south of the San Francisco-Oakland Bay Bridge while the main lobe flowed seaward 30 km, covering an area of about 900 sq km. Salinity differences of 1-2 parts per thousand and light-transmission differences of 15-20% were measured between the plume and the ambient waters. As the discharge from the Sacramento-San Joaquin River system decreased to 100 cu m/s, the surface area of the plume in the Gulf of the Farallones decreased to about 100 sq km. In south San Francisco Bay, the plume characteristics are different during high and low river discharge. As the discharge decreased from 7,800 cu m/s in the winter to 100 cu m/s in the summer, the flow rate of the plume front into the south bay decreased from 113 cm/s to 65 cm/s. These seasonal changes in flow rates and volumes of this critical water source must be considered when developing physical and chemical models of the estuary. (Knapp-USGS)
W74-13180

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W74-13317

SURVIVAL OF SALMONELLA TYPHIMURIUM IN ARTIFICIAL AND COASTAL SEA WATER,
Rhode Island Univ., Kingston. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W74-13361

FISH AND SHELLFISH FARMING IN COASTAL WATERS,
P. H. Milne.
Fishing News(Books) Ltd.: London, England. 1972. 208p, Illus. Maps.
Identifiers: Crab, Crustaceans, *Fish farming, Mollusks, *Shellfish farming, *Coastal waters.

Guidance is provided on all aspects needed for success in the field of fish and shellfish in coastal waters. Preliminary chapters emphasize the need for the marine biologist and engineer to work together in this bioengineering field to design and construct adequate facilities for successful sea farming. A general survey is made of the marine species of molluscs, crustaceans, and fish suitable for use. Legal aspects are discussed after which the points for selecting a site are analyzed and the materials to be used tested. Other chapters discuss the design and construction of hatcheries, ponds, raceways and tanks, together with their associated hydraulic and pumping requirements. The techniques for locating, designing and constructing intertidal, sub-littoral and seabed farming facilities are discussed together with the use of floating cages and rafts. Three chapters are devoted to problems to be encountered, including the effect of marine enclosures on environment, the control predators (starfish, crabs, sea birds, etc.) and marine pollution and its effects. Finally, new materials and techniques available in the field are discussed. The book is applicable to all coastal zone activities in any area of the world suitable for sea farming.--Copyright 1973, Biological Abstracts, Inc.
W74-13408

MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA, PART II. BIOLOGICAL INVESTIGATIONS.
For primary bibliographic entry see Field 5B.
W74-13461

OBSERVATIONS ON THE HYDROLOGY AND MARINE ORGANISMS OF THE TIDAL COLORADO RIVER AND ADJACENT WATERS, TEXAS, FEBRUARY-JUNE 1962,
National Marine Fisheries Service, Galveston, Tex. Biological Lab.
For primary bibliographic entry see Field 5B.
W74-13463

GALVESTON BAY BENTHIC COMMUNITY STRUCTURE AS AN INDICATOR OF WATER QUALITY,
Texas Univ., Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5A.
W74-13464

A SPORT FISHING SURVEY IN THE VICINITY OF A STEAM ELECTRIC STATION ON THE PATUXENT ESTUARY, MARYLAND,
Academy of Natural Sciences of Philadelphia, Pa.
C. J. Moore, G. A. Stevens, A. J. Mcerlean, and H. H. Zion.
Chesapeake Sci. Vol 14, No 3, p 160-170. 1973, Illus.

Descriptors: Estuaries, Fishing, *Sport fishing, Recreation, Canals, Effluent streams, Perches, Sport fish, Marine fish, Sea basses, Striped bass, Bass, *Maryland, Electric power plants, Crabs.
Identifiers: *Patuxent estuary(Md), Spot.

An interview-count sport fishing survey was conducted from May 1971-April 1972 within 10,340 acres of the Patuxent Estuary, from Jacks Bay to Holland Cliff, including the effluent canal of the Potomac Electric Power Company's steam electric stations (SES) located at Chalk Point, Maryland. An estimated 41,238 angler trips, totaling 170,535 h, were made within this area of the Patuxent Estuary during the period sampled. These anglers caught 383,900 fish, of which 176,900 were kept and 207,000 were returned to the water. The average angler spent 4.1 h/trip and harvested 1.0 fish/h or 4.0 fish/trip. White perch dominated the catch with 188,200 caught and 102,900 harvested. Of 69,500 striped bass caught, 66,000 were under the legal size limit of 12 in. and were returned to the water. Spot were taken throughout the estuary during June-Oct., with 19,500 being harvested. Small catches of spot continued to be reported only within the heated effluent canal during Nov., Dec. and March. Over 50% of all angler trips were made to the heated effluent canal of the Chalk Point SES, with over 90% of these trips being made during the cooler seasons from Oct.-April when little or no fishing occurred within other areas of the estuary. An estimated 13,500 recreational crabbers spent 59,200 h and harvested 101,700 crabs from May-2 Nov. These crabbers averaged 1.7 crabs/h and 7.5 crabs/trip. Results are compared to a similar sport fishing survey carried out within this area of the Patuxent Estuary prior to the operation of the SES.--Copyright 1974, Biological Abstracts, Inc.

W74-13472

SEDIMENTATIONAL REGIMES OF THE YORK RIVER, SOUTHEASTERN VIRGINIA, AS SHOWN BY MASS PROPERTIES,
Lafayette Coll., Easton, Pa. Dept. of Geology.
R. W. Faas.
Chesapeake Sci. Vol 14, No 3, p 181-187. 1973, Illus.

Descriptors: Sedimentation, *Rivers, *Virginia, Estuaries, *Sediments, Silts, Clays, Deposition(Sediments), Physical properties, Soil physical properties, Soil mechanics, Shear strength, Mechanical properties, Sediment control, Soil properties.
Identifiers: *York River(Va).

Techniques of terrestrial soil mechanics, modified to include in situ sampling using scuba gear, showed differences in sediment mass properties between various reaches of the York River, a coastal plain estuary of southeastern Virginia (USA), which are interpreted as delineating areas of sediment removal and deposition within the estuary. Sediments found in the upper and portions of the estuary are similar in their mass properties. Both are 'silty clays' and possess low unit weight and very high moisture content. The middle estuary contains 'silty clays' possessing high unit weight and lower moisture content. Shearing strength is lowest in the upper estuary, slightly greater in the middle reaches, and much greater in the lower estuary. Deposition is probably proceeding rapidly in both upper and lower estuarine areas. The middle estuary appears to be a surface of sedimentary bypassing. Sediment shearing strength must be considered when planning channel modifications. Current velocities which impose bottom shear stresses in excess of measured shear strength will initiate scouring. Design criteria should include acceptable velocities for given reaches of rivers undergoing modifications, given a knowledge of mass property distributions.--Copyright 1974, Biological Abstracts, Inc.
W74-13473

THE INTERTIDAL LAMELLIBRANCHES OF SOUTHAMPTON WATER, WITH PARTICULAR REFERENCE TO CERASTODERMA EDULE AND C. GLAUCUM,
Cambridge Univ. (England). Dept. of Zoology.
R. S. K. Barnes.
Proc Malacol Soc Lond. Vol 40, No 5, p 413-433. 1973, Illus.

Descriptors: *Mollusks, Estuaries.
Identifiers: Cerastoderma edule, Cerastoderma glaucum, *United Kingdom(Southampton Water-Eng).

The distribution of 15 spp. of lamellibranch molluscs and the density and population structure of 2 of them, C. edule and C. glaucum, were investigated at 7 sites along Southampton Water (England). The fauna of Southampton water conforms to a variety of the widespread Macoma balthica community of sheltered, muddy and often estuarine habitats, including a number of introduced species. Only C. edule, Mercenaria mercenaria and (prior to the summer of 1970) C. glaucum were abundant. The distribution of C. glaucum is at variance with various salinity hypotheses. This species may have been displaced from brackish habitats into the Water by land reclamation and is probably being displaced now from the Water by the pre-existing populations of C. edule. In the winter of 1969-70, C. glaucum formed 98% of the cockle population at Hythe but since Nov. 1970 it formed only 20% and has rarely occurred in densities exceeding 90/sq m. At the 3 other stations where C. glaucum occurs, it did not form more than 5% of the cockle populations, rarely occurred in densities greater than 15/sq m and showed negligible annual recruitment. C. edule occurred in densities of about 20-35/sq m near the mouth of Southampton Water but was abundant in the central regions and near the head. The population structure of C. edule showed, with 1 exception, a trend from a state of 'each annual recruitment forming a large proportion of the total standing crop, a small average size and size range and with few year groups represented in the population' near the head to 'negligible annual recruitment as a percentage of the total population, a large average size and size range, and a stable population with many year groups represented' at the mouth. This trend may be caused by the nature of the substrate. The growth rate of cockles in Southampton Water is negligible at 1 site and from low to moderate at others.--Copyright 1974, Biological Abstracts, Inc.
W74-13474

A TRAWL STUDY OF NEARSHORE FISHES AND INVERTEBRATES OF THE GEORGIA COAST,
University of Southwestern Louisiana, Lafayette. Dept. of Biology.
H. D. Hoese.
Contrib Mar Sci. 17 p, 63-98. 1973, Illus.

Descriptors: Fish, *Invertebrates, *Georgia, Seawater, Aquatic animals, Marine fisheries, Commercial fishing, Estuaries, Coasts.
Identifiers: Diplectrum-formosum, Hemipteronotus-novacula, *Nearshore fishes, Penaeus-setiferus, Stellifer-lanceolatus, Turbidity.

A trawl study was conducted for a 12 mo. period in 1956-66 on the central Georgia inshore continental shelf and adjacent Doboy Sound. Hydrographic data showed the area to be relatively salty, apparently subject to major influence by the Altamaha River, winds, but rarely by longshore currents. Turbidity best delineated the water masses with clear oceanic water about 6 miles offshore, occasionally with intermediate waters. The distribution of many species of motile invertebrates and fishes correlated with either the water masses of sediment type which became coarser offshore. The inshore fauna, a warm temperate one, was characterized by Stellifer lanceolatus and Penaeus setiferus. Offshore the fauna became subtropical, characterized by Diplectrum formosum and Hemipteronotus novacula. A small cool temperate fauna invaded during winter. The absence of large benthic plant communities excludes the large fauna associated with it. However, the turbidity limiting plant growth was associated with up to 8 times the biomass found in clearer offshore waters. There was no evidence gathered indicating any potential unexploited commercial fisheries.--Copyright 1974, Biological Abstracts, Inc.
W74-13475

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DISTILLATION APPARATUS,
J. D. Wixson.
US Patent No 3,827,945, 4 p, 4 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 925, No 1, p 233, August 6, 1974.

Descriptors: *Patents, *Desalination apparatus, *Distillation, Evaporation, *Condensation, Sea water, Fresh water, Heat exchangers.

This apparatus provides a distillation system in which heat flows from the fluid being cooled to the fluid being heated in a manner which is essentially recirculating counterflow exchange. This specifically includes counterflow heat exchange between the raw liquid entering the system on one hand and the condensate and concentrate leaving the system on the other; recovery of heat of condensation from the condenser and reintroduction of this heat into the evaporator; and counterflow heat exchange from the cooling superheated gas or steam to that vapor which has just evaporated and is being superheated to remove entrained impurities. (Sinha-OEIS)
W74-12804

DRAINAGE AND LAND RECLAMATION IN THE LOWER MESOPOTANIAN PLAIN,
International Agricultural Centre, Wageningen (Netherlands).
For primary bibliographic entry see Field 4A.
W74-13148

HYGIENIC EVALUATION OF POLYMERS USED IN THE MEMBRANE METHODS OF WATER DESALINATION (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Selskoi Gigieny, (USSR).
For primary bibliographic entry see Field 5D.
W74-13159

THE POTENTIAL ROLE OF MODERN DESALINATION TECHNOLOGY IN THE DEVELOPMENT OF FRESH WATER SUPPLIES IN UNDER-DEVELOPED TERRITORIES,
C. Peel.
Water Service, Vol 78, No 938, p 119-123, April 1974. 3 fig, 1 tab.

Descriptors: *Desalination, *Desalination plants, *Desalination processes, Membrane processes, Water supply, Chemical reactions.

Estimates of the future world population growth rate, food supply, and fresh water needs are discussed briefly. Statistics on presently installed and operating desalination plants are given. The various desalination techniques presently available or under development are outlined under the following headings: processes involving a change of phase, methods utilizing some form of membrane, and processes based on a chemical reaction. (Sandoski-FIRL)
W74-13435

3B. Water Yield Improvement

SURFACE WATER RESOURCES OF THE USSR AND THEIR CHANGE UNDER THE EFFECT OF INDUSTRIAL AND AGRICULTURAL ACTIVITY,
For primary bibliographic entry see Field 4A.
W74-12983

JOJOBA: A WAX-PRODUCING SHRUB OF THE SONORAN DESERT, LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 2I.
W74-13141

DESERT ECOSYSTEMS: ENVIRONMENT AND PRODUCERS,
Hebrew Univ., Jersualem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 2A.
W74-13150

POTENTIAL CUMULUS RAINFALL MODIFICATION, PANAMA CANAL ZONE,
Environmental Prediction Research Faculty (Navy), Monterey, Calif.
P. Lowe.
Available from NTIS, Springfield, Va. 22161 as AD-775 616, Price $3.25 printed copy; $2.25 microfiche. Technical Paper No 10-73, December 1973. 18 p, 20 tab, 2 ref.

Descriptors: *Weather modification, *Cloud seeding, Artificial precipitation, Simulation analysis, *Canal Zone.
Identifiers: Panama.

Natural and modified cumulus clouds appropriate to the Panama Canal Zone were analyzed by computer simulation to derive tables of the probability of increasing or decreasing rainfall, the expected amounts of rainfall increase or decrease, and indices of potential yield arising from cumulus cloud modification. Clouds of 1.5 km radius have the highest potential. The larger the cloud, the greater the absolute yield. On days when cumulus rainfall is forecast, modification will result in a better water yield. The month of November has more seeding potential than the season in general. (Knapp-USGS)
W74-13168

QUANTITATIVE AND HISTORICAL EVIDENCE OF VEGETATION CHANGES ALONG THE UPPER GILA RIVER, ARIZONA,
Geological Survey, Tucson, Ariz.
R. M. Turner.
Professional Paper 655-H, 1974. 20 p, 10 fig, 2 tab, 4 ref.

Descriptors: *Channel morphology, *Phreatophytes, *Arizona, *Tamarisk, Riparian plants, Flood plains, Vegetation effects, Geomorphology.
Identifiers: *Saltcedar, *Gila River(Ariz).

Vegetation maps showing past conditions along a 24-kilometer (about 15-mile) reach of the upper Gila River valley were compared with a recent vegetation map to determine changes in vegetation. The maps, which were made during 1914, 1937, 1944, and 1964, provide a quantitative record of changes through half a century. Historical records and recent surveys show that the width of the Gila River channel has changed from narrow (pre-1900) to broad (early 1900's), to narrow (1960). The vegetation has not changed in a similar cyclic manner - the vegetation adjacent to the narrow channel of a century ago was vastly different from that adjacent to the narrow channel of the 1960's. During the last period (1944-1964), saltcedar, an introduced species has dominated the low areas bordering the channel, having replaced such native species as seepwillow and cottonwood. Possible causes for the altered conditions are channel changes, dam construction, changes in frequency of fires, altered streamflow pattern, and the effect of saltcedar introduction. The time of the plant's most rapid expansion outside the limits of the reservoir did not coincide with any major disruption of the flood-plain environment. Saltcedar can eliminate native riparian species, such as cottonwood and seepwillow, without the aid of environmental alterations. (Knapp-USGS)
W74-13174

THE ROLE OF ELECTRICAL FORCES IN THE DEVELOPMENT AND DISSIPATION OF CLOUDS AND FOGS,
University of Manchester Inst. of Science and Technology (England). Dept. of Physics.
J. Latham, and M. H. Smith.
Available from NTIS, Springfield, Va 22161 as AD-777 010, Price $3.25 printed copy; $2.25 microfiche. Manchester University Institute of Science and Technology, Final Technical Report, December 1973. 21 p, 4 tab, 14 ref. DAJA37-73-C-1623.

Descriptors: *Cloud physics, *Weather modification, *Rainfall, *Fog, Electrical studies, Raindrops, Rain, Evaporation.

The influence of evaporation and drop-interactions on a rainshaft and the feasibility of dispersing fogs by electrical forces were studied in laboratory experiments. The interactions are described by a generalized stochastic equation which takes account of the variation of coalescence efficiency with drop radii and the fact that satellite drops are produced when drops separate after collision. Calculations were made for 3 different situations in order to isolate the physical processes which most affect the rainfall: (1) evaporation without interaction; (2) interaction without evaporation; (3) both interaction and evaporation. The presence of high charges on drops greatly increases the rate at which they coalesce with smaller droplets. The introduction of charged drops can possibly provide a feasible technique for the dispersion of quiescent warm fogs over airport runways. (Knapp-USGS)
W74-13199

ICE PROJECT-ICE CRYSTAL INHIBITION-AN APPLICATIONS PROGRAM OF CHEMICAL DISPERSAL IN SMALL CUMULUS CLOUDS,
Atmospherics, Inc., Fresno, Calif.
T. J. Henderson, and D. W. Duckering.
Available from NTIS, Springfield, Va 22161 as AD-775 630, Price $3.75 printed copy; $2.25 microfiche. Final Report to Naval Weapons Center, Earth and Planetary Sciences Division, June 15, 1973. 35 p, 22 fig. NWC Contract NO0123-72-C-1723.

Descriptors: *Cloud seeding, *Weather modification, Organic compounds, Freezing, Crystal growth, Cloud physics, Ice.
Identifiers: *Ethylamine, *Morpholine.

Ethylamine and morpholine were tested for their effects of cumulus cloud developments. Morpholine when applied in the inflow area at cloud base and within a temperature regime warmer than 0 deg C may inhibit ice crystal formation and growth in those cases where cloud top temperatures are colder than -9 C and glaciation has been noted in untreated control clouds. Ethylamine when applied to the inflow area at cloud base and within a temperature regime warmer than 0 dec C, may enhance ice crystal formation and growth in those cases where glaciation was not observed prior to treatment. Ethylamine enhances the process of ice crystal growth and possibly formation. Morpholine increases intensities and areal extent of precipitation. (Knapp-USGS)
W74-13212

EXPERIMENTS SUPPORTING A PROGRAM OF WARM FOG DISPERSAL BY ELECTRICAL CHARGE INJECTION,
Naval Postgraduate School, Monterey, Calif.
G. E. Schacher, and W. Reese.
Available from NTIS, Springfield, Va 22161 as AD-775 911, Price $3.75 printed copy; $2.25 microfiche. Report NPS-6 SqRc74011 (Final report for period January 1973-January 1974), January 28, 1974. 39 p, 6 fig, 3 tab, append.

Descriptors: *Fog, *Weather modification, *Electrical studies, Cloud physics, Electrical coronas, Extra high voltage.
Identifiers: *Fog clearing, *Fog dispersal.

Fog clearing by injection of electrical charges into the fog was studied by experiments made to determine the charge transferred to water sprays. Contact charging mechanisms were as much as 1 million times as effective as induction charging mechanisms. The charge on soap film bubbles was measured. For a 2-inch bubble formed at 30 kV the charge was on the order of 1 microcoulomb. Tests of fog clearing in an environmental chamber indicated fair results with water spray techniques and much better results with techniques by which charge is injected directly into the atmosphere (corona injection). Preliminary tests of corona injection into the atmosphere showed that considerable charge attached to windborne particles. (Knapp-USGS)
W74-13216

ALPINE LAKE PROJECT ALPINE, TEXAS, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W74-13224

HYGIENIC FEATURES OF PERCOLATION WATER INTAKES (IN RUSSIAN),
Municipal Sanitary-Epidemiological Center, Pyatigorsk (USSR).
For primary bibliographic entry see Field 4B.
W74-13400

3C. Use Of Water Of Impaired Quality

CALCIUM CARBONATE EQUILIBRIA IN SOILS AND IN IRRIGATION WATERS,
New Mexico State Univ., Las Cruces. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W74-12862

CONFERENCE ON RECYCLING TREATED MUNICIPAL WASTEWATER THROUGH FOREST AND CROPLAND.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W74-12869

WASTEWATER TREATMENT: WATER RECLAMATION AND REUSE,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W74-12939

SHELLFISH CULTURE USING THE HEATED EFFLUENT FROM ELECTRIC POWER PLANTS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W74-13045

DRAINAGE AND LAND RECLAMATION IN THE LOWER MESOPOTANIAN PLAIN,
International Agricultural Centre, Wageningen (Netherlands).
For primary bibliographic entry see Field 4A.
W74-13148

QUALITY OF GROUND WATER IN BIKANER DISTRICT OF WESTERN RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 4B.
W74-13151

SALT PROFILES OF SOILS: INVESTIGATIONAL METHODS AND LEVEL OF SIGNIFICANCE: APPLICATION TO HALOMORPHIC SOILS IN SOUTHERN FRANCE (IN FRENCH),
Institut National de la Recherche Agronomique, Montpellier (France). Service d'Etudes des Sosl.
For primary bibliographic entry see Field 2G.
W74-13162

PREDICTED QUALITY OF J. G. STRIJDOM DAM WATER AND ITS SUITABILITY FOR IRRIGATING CERTAIN MAKATINI SOILS,
Fort Hare Univ. (South Africia).
M. Hensley.
Agrochemophysica. Vol 4, No 2, p 21-24, 1973.
Identifiers: Carbonate, Sodium, Strijdom dam, Salts, *Irrigation water.

A procedure for predicting the composition of the dam water is outlined. The estimated composition is presented. It is found to be C2-S1. More detailed assessment of quality making allowance for carbonate precipitation as a result of concentration of the soil solution between irrigations is described. An alternative procedure for assessing the Na hazard is outlined. The dam water will probably have no significant salinity hazard, but under certain conditions the Na hazard may be significantly high.--Copyright 1973, Biological Abstracts, Inc.
W74-13248

THE EFFECT OF WATER-SALT REGIME OF SOIL ON THE GROWTH OF QUERCUS ROBUR, (IN BYCLORUSSIAN),
R. S. Lavryshcheva.
Visn Sil'skohospod Nauk. 5. 73-76. 1970. Russian summary.
Identifiers: Quercus Robur, Salts, Soils, *Oak trees, *Saline soils.

The growth of oak in relation to the humidity and salinity of soil of 2 plots was studied in the floodplain of the Samara River, USSR, in 35-yr-old plantations on chernozem-meadow soils of low salinity (Plot A) and chernozem-meadow soils of high salinity (Pilot B). There was 50% less wood standing volume and 20% less timber standing volume in plot B then in plot A. At 5 yr of age, the height of oak in these plots was 0.9 and 2.0 m, respectively. Increment culmination of oak occurred at 15-25 yr of age, constituting 0.4-0.5 m annually in plot A, and 0.2-0.4 m in plot B. The insignificant moistening of soils on both plots is pointed out. The highest soil humidity (12-17% by weight) was at a depth of 30-150 cm (Plot B) due to the poor permeability of salinized soils to water. The water-soluble salt content in plot A was insignificant (dry residue 0.040-0.086%; pH=6.4-7.1); in plot B it was considerably higher (on the average, dry residue is 0.074-0.336%, pH=7.1-8.2), attaining a maximum in the 100-150 cm layer. On the more salinized soils with a dry residue of chlorides, sulfates of Na and soda of 0.426-0.582% and pH-8.4, the death of yound oak trees occurred. Oak on the salinized soil of the Samara River floodplain is obviously a salt-resistant species.--Copyright 1973, Biological Abstracts, Inc.
W74-13393

RESPONSE OF SAFFLOWER (CARTHAMUS TINCTORIUS L.) TO SALINITY OF SEA WATER,
Central Salt and Marina Chemicals Research Inst., Bhavnagar (India).
T. Kurian, and E. R. R. Iyengar.
Indian J Agric Sci. Vol 42, No 8, p 717-721, 1972. Illus.

Descriptors: *Sea water, Salinity, Salt tolerance, Irrigation.
Identifiers: Carthamus tinctorius, Safflower.

In pots containing shore sand, 45-day-old seedlings of C. tinctorius were irrigated with seawater of 15,000 and 20,000 ppm and its amendments with Hoagland solution. Irrigations given at an interval of 4-6 days reduced the height of plants, the yield of grains and 1000-grain weight from the primary and secondary heads. Sea-water of 20,000 ppm with Hoagland's solution was ineffective in increasing the yield of the grains from the secondary heads. The oil content was not markedly affected by salinity of sea-water or its amendments. There was accumulation of minerals in leaves and stem. Amendment of sea-water with Hoagland's solution resulted in a reduction in the uptake of Na and an accumulation of N, K and Ca by the crop. Safflower was found moderately tolerant to sea-water irrigations; considerable improvement was achieved with proper amendment of sea-water.--Copyright 1973, Biological Abstracts, Inc.
W74-13462

3D. Conservation In Domestic and Municipal Use

DEVELOPMENT OF CRITERIA FOR EVALUATING URBAN RIVER SETTINGS FOR TOURISM-RECREATION USE,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 6B.
W74-12866

ESTABLISHMENT OF A CLOSED SYSTEM FOR THE PAPERMAKING PROCESS,
Mo och Domsjo A.B., Ornskoldsvik (Sweden).
For primary bibliographic entry see Field 5D.
W74-12944

A CONCEPTUAL AND EMPIRICAL ANALYSIS OF WATER PRICING IN MISSISSIPPI MUNICIPALITIES,
Mississippi Univ., Oxford. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6B.
W74-13054

NATURAL RESOURCE INVENTORY FOR URBAN PLANNING UTILIZING REMOTE SENSING TECHNIQUES,
Arizona Univ., Tucson. Office of Arid Lands Studies. Office of Arid Lands Studies, Arizona Univ., Tucson.
For primary bibliographic entry see Field 6B.
W74-13143

ENVIRONMENTAL ASSESSMENT OF WATER-SYSTEM IMPROVEMENTS,
East Bay Municipal Utility District, Oakland, Calif.
For primary bibliographic entry see Field 5G.
W74-13265

COMPUTERIZED REPORTS IMPROVE SEWER MAINTENANCE,
For primary bibliographic entry see Field 5G.
W74-13339

WATER POLLUTION ASPECTS OF STREET CONTAMINANTS,
Illinois State Univ., Normal. Coll. of Applied Science and Technology.
For primary bibliographic entry see Field 5B.
W74-13411

A MATHEMATICAL EXAMINATION OF URBAN RUN-OFF PREDICTION,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 4C.
W74-13449

3E. Conservation In Industry

ANALYSIS OF WATER CHARACTERISTICS OF MANUFACTURING INDUSTRIES AND THEIR ADAPTABILITY TO SEMI-ARID REGIONS,
New Mexico Univ., Albuquerque. Dept. of Economics.
S. Ben-David, F. L. Brown, Jr., H. G. Folster, and E. F. Thode.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 280, $6.25 in paper copy, $2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report 040, June 1974. 155 p, 12 fig, 33 tab, 126 ref, 3 append. OWRT B-032-NMEX(1).

Descriptors: *Water requirements, *Industrial water, *Industrial wastes, *Oil industry, *Coals, Industrial plants, Water pollution sources, Water pollution treatment, Water consumption, Economic feasibility, Biological treatment, *New Mexico, Water demand, Arid lands, Southwest US.
Identifiers: *Coal gasification, *Petroleum refining, *Waste treatment costs, Physical-chemical treatment.

Historically arid and semi-arid areas of the Southwest have exhibited almost a complete dearth of manufacturing processes. Such areas must give more careful and considered thought to the water related impact of an industry than has generally been the case. Three significant categories into which an industrial water-using firm's impact can be classified are: (1) the polluting effect of its effluent, (2) its withdrawal demand for new water, and (3) its consumptive use of water. For informed planning more information is required concerning the present operating characteristics of major water-using industries in these categories and their technological ability to adapt to the economic and environmental conditions in the Southwest. The industries chosen for study were petroleum refining and coal gasification. Selection criteria were a probability of the industry locating in New Mexico, a differing water use pattern, and process substitution possibilities. Attention is given to process descriptions. Brief discussions are presented of the major New Mexico river and water basins, water quality measurement concepts, and wastewater treatment processes currently being used or having a high potential for use. The results should permit a ranking of other industries from a water-use viewpoint through the application of the concepts presented and to allow comparative evaluations. (Hain-New Mexico State)
W74-12863

THE FLOW OF MERCURY IN SOCIETY,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-12919

MITSUBISHI FLOTATION DEINKING SYSTEM SAVES WATER, STEAM AND CHEMICALS.
Japan Pulp and Paper, Vol 11, No 2, p 53-55, July 1973. 9 fig.

Descriptors: *Pulp wastes, *Industrial water, *Water conservation, *Flotation, *Pulp and paper industry, *Foreign research, Fibers(Plant), Solid wastes, Industrial wastes, Dispersion, Operation and maintenance, Waste treatment, Recycling, Steam, Additives, Chemicals.
Identifiers: Japan, *Deinking, Waste papers, Printing inks, Inks.

Significant reductions in the consumption of industrial water, steam, and chemical additives are reported for a waste paper deinking, fiber recovery, and pulp stock preparation system developed jointly by Mitsubishi Heavy Industries, Ltd. and Mitsubishi Metal Mining Co., Ltd. in Japan. Both the fiberization of collected printed waste papers and the separation and dispersion of ink particles are carried out at relatively high stock consistencies (6.5-9.0% fiber solids). Schematic outlines of the equipment are given. Effects of operating variables on the resulting paper pulp are also illustrated. (Witt-IPC)
W74-12926

SAVING ENERGY THROUGH RECYCLING PAPER MILL PROCESS WATER,
For primary bibliographic entry see Field 5D.
W74-12952

MAN BITES DOG: THE TALE OF HOW A PULP MILL WAS RESCUED FROM BEING POLLUTED TO DEATH,
Alliance Paper Mills Ltd., Merritton (Ontario).
For primary bibliographic entry see Field 5G.
W74-12955

INTENSIFICATION OF SAND FILTER OPERATION (INTENSIFIKATSIYA RABOTY PESCHENYKH FIL'TROV),
All-Union Research Inst. for the Paper Industry, Astrakhan (USSR).
For primary bibliographic entry see Field 5D.
W74-12958

REDUCTION OF WASTE WATER POLLUTION IN PAPERBOARD MILLS (SNIZHENIE ZAGRYAZNENIYA STOCHNYKHVOD NA KARTONNYKH FABRIKAKH),
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev (USSR).
For primary bibliographic entry see Field 5D.
W74-12961

NEW ENERGY TECHNOLOGY RESEARCH AND DEVELOPMENT: A RATIONALE FOR SETTING PRIORITIES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6B.
W74-13123

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED BRAIDWOOD STATION, COMMONWEALTH EDISON COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-13129

IRON: A TWO-EDGED SWORD.
For primary bibliographic entry see Field 5D.
W74-13267

ATMOSPHERIC COOLERS FOR COOLING INDUSTRIAL WATERS,
For primary bibliographic entry see Field 5D.
W74-13275

EFFLUENT TREATMENT AT PLESSEY CO LTD.
For primary bibliographic entry see Field 5D.
W74-13308

RATIONAL ORGANIZATION OF WATER CONSUMPTION IN THE WOOD PREPARATION ROOM OF PULP AND PAPER MILLS (ORGANIZATSIYA RATSIONAL'NOGO VODOPOL'ZOVANIYA V DREVESNOPODGOTOVITEL'NYKH TSEKHAKH TSELLYULOZNO-BUMAZHNYKH PREDPRIYATII),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR).
A. S. Vinograd.
Issledovaniya v Oblasti Proizvodstva Polufabrikatov i Ochistki Promyshlennykh Stokov, Sbornik Trudov VNNIB, No 61, p 204-211, 1972. 1 tab.

Descriptors: *Pulp and paper industry, *Water consumption(Except consumptive use), *Water conservation, *Industrial water, *Pulp wastes, Discharge(Water), *Water pollution control, *Wood wastes, Bark, Waste water(Pollution), Industrial wastes.
Identifiers: Pulpwood, Logs(Pulpwood), Storage ponds, Woodrooms(Pulp mill), Barking(Debarking), USSR.

Water consumption in most woodrooms of the USSR accounts for ca. 10-12% of the total water consumed by a pulp and paper mill. Average daily consumption in woodrooms of large mills is 60,000 to 80,000 cu m. An approximately equal volume of water polluted by bark plus organic and inorganic dissolved materials is being discharged into natural waters. About 4 to 8 cu m of water is consumed in barking 1 solid cu m of wood. A water-use survey of 13 Soviet mills in 1969-70 led to a collection of typical data and to practical recommendations for water conservation. It is estimated that water consumption can be lowered to a 2-3 cu m per solid cu mof wood by discontinuing water use for pulpwood transport, by instituting strict accounting and control of water consumption, and by building special log-thawing and log-storage ponds. (Stapinski-IPC)
W74-13426

3F. Conservation In Agriculture

IRRIGATION RISER BASE SYSTEM,
Coca-Cola Co., Atlanta, Ga. (assignee).
R. H. Heenan, and G. M. Litsinger.
US Patent No 3,825,186, 4 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 924, No 4, p 903, July 23, 1974.

Descriptors: *Patents, *Irrigation systems, *Soil water movement, Equipment.
Identifiers: Irrigation riser.

This system comprises a riser base having a central longitudinal tube manufactured of a plastic material with fin portions. The fins extend from the top to the bottom of the riser base to take advantage of the soil resistance capabilities. A locking screw cap and O-ring assembly are provided on the top of the riser base to create a quick release coupling seal and prevent leakage between the central tube and riser pipe. The longitudinal tube is adapted to couple with the riser pipe and a check valve assembly is provided at the bottom of the riser base to prevent the flow of irrigation water when the riser pipe is removed for cleaning. (Sinha-OEIS)
W74-12801

CONFERENCE ON RECYCLING TREATED MUNICIPAL WASTEWATER THROUGH FOREST AND CROPLAND.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W74-12869

SITE SELECTION CRITERIA FOR WASTEWATER DISPOSAL -- SOILS AND HYDROGEOLOGIC CONSIDERATIONS,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
For primary bibliographic entry see Field 5D.
W74-12875

RENOVATION OF MUNICIPAL WASTEWATER THROUGH LAND DISPOSAL BY SPRAY IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-12876

PHOSPHORUS AND NITRATE LEVELS IN GROUNDWATER AS RELATED TO IRRIGATION OF JACK PINE WITH SEWAGE EFFLUENT,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
For primary bibliographic entry see Field 5D.
W74-12878

VEGETATION RESPONSES TO IRRIGATION WITH TREATED MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W74-12885

ANATOMICAL AND PHYSICAL PROPERTIES OF RED OAK AND RED PINE IRRIGATED WITH MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W74-12886

DEER AND RABBIT RESPONSE TO THE SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT ON WILD LAND,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W74-12887

SPRINKLER IRRIGATION SYSTEMS: DESIGN AND OPERATION CRITERIA,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W74-12888

COST OF SPRAY IRRIGATION FOR WASTE WATER RENOVATION,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-12889

LARGE WASTEWATER IRRIGATION SYSTEMS: MUSKEGON COUNTY, MICHIGAN AND CHICAGO METROPOLITAN REGION,
Bauer Engineering, Inc., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-12891

MT. SUNAPEE STATE PARK, NEW HAMPSHIRE SPRAY IRRIGATION PROJECT,
New Hampshire Water Supply and Pollution Control Commission, Concord.
For primary bibliographic entry see Field 5D.
W74-12893

UTILIZATION OF SPRAY IRRIGATION FOR WASTEWATER DISPOSAL IN SMALL RESIDENTIAL DEVELOPMENTS,
Williams and Works, Inc., Grand Rapids, Mich.
For primary bibliographic entry see Field 5D.
W74-12894

MUNICIPAL WASTEWATER DISPOSAL ON THE LAND AS AN ALTERNATE OF OCEAN OUTFALL,
Bauer Engineering, Inc., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-12896

SPRAY IRRIGATION--THE REGULARTORY AGENCY VIEW,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Ground Water Quality Management Unit.
For primary bibliographic entry see Field 5D.
W74-12900

EFFECT OF FLOODING AND CROPPING ON THE CHANGES IN THE INORGANIC PHOSPHATE FRACTIONS IN SOME RICE SOILS,
University of Agricultural Sciences, Mandya (India). Regional Research Station.

For primary bibliographic entry see Field 2G.
W74-12925

INCREASE IN CONDUCTIVITY OF IRRIGATION WATER DURING SPRINKLING,
California Univ., Davis. Dept. of Water Science and Engineering.
F. E. Robinson.
Agron J. Vol 65, No 1, p 130, 1973.

Descriptors: *Conductivity, Water properties, *Salinity, *Sprinkler irrigation, Irrigation, Desert.
Identifiers: Medicago-sativa.

The test was conducted on a high evaporative demand July day to evaluate the possible harm that could result from concentration of salinity as water is sprinkled in an arid desert area. Catchment beakers (250 ml) were set at 19-m intervals across a 190-x 219-m alfalfa (Medicago sativa L.) field that was sprinkled for 19.5 hr. Conductivity of the sprinkler water increased 21% on the field edge and 4.4% inside the field.--Copyright 1973, Biological Abstracts, Inc.
W74-12966

THE INFLUENCE OF SOIL CONDITIONERS ON STRUCTURE AND YIELDS IN HORTICULTURAL SUBSTRATES, (IN GERMAN),
H. Rasp.
Z Pflanzenernaehr Bodenkd. Vol 133, No 1/2, p 111-123. Illus. 1972. English summary.

Descriptors: *Crops, *Crop response, *Fertilizers, Nitrogen, Soils, Loam, Grasses, Sands, Vegetation establishment.
Identifiers: Compost, Hygromull, Hygropor-73, Sand, Foams, Synthetic foams.

The effects of additions synthetic foams Hygromull and Hygropor 73 to compost, sand and loam were studied. Yield (pasture grass) increased with the addition of Hygromull, but the highest yield was found with the addition of Hygropor 73. The amount of N in the plant increased parallel to the yield and the highest amount was in the variant with Hygropor 73. Apparent specific weight of soil decreased significantly by addition of Hygromull and Hygropor 73. Total pore volume increased on addition of Hygromull, but compared to the variant with 50 Vol.% Hygromull Hygropor 73 reduced it. Air permeability after Kmoch increased on addition of foam substances, especially in compost and loam, in sand only in the variant without vegetation. Water content below pF 2.54 was significantly increased; however, there was no difference between pH 2.54 and 4.2.--Copyright 1974, Biological Abstracts, Inc.
W74-13022

PRESOWING IRRADIATION OF SEEDS OF AGRICULTURAL PLANTS,
For primary bibliographic entry see Field 5C.
W74-13115

APPLICATION OF REMOTE SENSING TO STATE AND LOCAL GOVERNMENT (ARSIG),
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6F.
W74-13140

WATER BUDGET ESTIMATION IN BELLARY REGION,
Indian Council of Agricultural Research, Bellary. Southern Regional Soil Conservation Research Sub-Station.
For primary bibliographic entry see Field 2D.
W74-13145

NITROGEN FERTILIZATION OF FODDER SORGHUM M. P. CHARI (SORGHUM BICOLOR) GROWN UNDER RAINFED CONDITIONS,
Indian Grassland and Fodder Research Inst., Jhansi.
C. T. Abichandani, A. S. Gill, R. K. Maurya, and N. D. Mannikar.
Annals of Arid Zone, Vol 12, No 1 and 2, p 71-76, March and June, 1973. 2 tab, 3 ref.

Descriptors: *Sorghum, *Nitrogen, *Fertilization, *Forage sorghum, Rainfall, Soils, Moisture tension, Proteins, Droughts, Clay loam, Sands.

Fodder sorghum cultivar M. P. Chari is grown under both rainfed and irrigated conditions because it is palatable to milch animals. A high demand is made of soil fertility, particularly nitrogen. Studies were made to determine the nitrogen needs and the levels of application necessary to refertilize the soil under rainfed conditions. Trials were conducted in two fields having different soil types, one a deep clay loam, and another a sandy loam. Treatments were carried out over a two-year period. Results were based on production of green fodder, dry matter, and crude protein content. Types of application were basal and split. Yields increased significantly in all cases with nitrogen application. Split application gave no advantage over basal application, and crude protein content increased during low rainfall years. (Mastic-Arizona)
W74-13146

INTERRELATIONSHIPS BETWEEN QUANTITATIVE GEOMORPHIC CHARACTERISTICS OF THE DRAINAGE BASINS IN SUB-HUMID TO HUMID ENVIRONMENT OF RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 4A.
W74-13147

FORECASTING YIELD OF WHEAT AND BARLEY FROM METEOROLOGICAL FACTORS IN RAIN-FED AREAS OF IRAQ,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
G. Gangopadhyaya, and N. A. Zaki.
Technical Bulletin 66, July 1974. 15 p, 4 tab, 8 ref.

Descriptors: *Forecasting, *Barley, *Wheat, *Crop production, *Meteorological data, Rainfall, Temperature, Regression analysis.
Identifiers: *Iraq.

Rainfall and temperature data were used to develop formulae for two principal cereal crops, wheat and barley, in Iraq. Rainfall from October to May, and total rainfall for January and April were factors that significantly influenced the yields. In addition, the average temperature for the months of January, March, April, and November had a significant effect on wheat yields. There did not appear to be any correlation between temperature and barley yields. Results are tentative, and require improvement based on additional meteorological data. (Mastic-Arizona)
W74-13154

RESOLVING WATER RESOURCE RIDDLES,
Minnesota Dept. of Natural Resources, St. Paul. Div. of Waters, Soils and Minerals.
E. Gere.
The Minnesota Volunteer, p 2-10, January-February, 1973. 2 illus.

Descriptors: *Minnesota, *Drainage programs, *Drainage practices, *Drainage effects, *Water resources development, Water policy, Administration, Governments, Wildlife conservation, State governments, Federal government, Adoption of practices, Land reclamation, Farm management, Land management, Surface water, Groundwater, Water supply, Resource allocation, Sedimentation, Algal blooms, Environmental effects, Eutrophication, Water law.

Contradictory objectives and projects exist within Minnesota's water resources program. Drainage and its impact are two current sources of debate. Minnesota has reclaimed more land through drainage than any other state except Indiana. Huge amounts of money are expended in draining new land and maintaining existing drainage systems. Yet at the same time the government pays individuals to keep land out of production. Both state and federal governments have bought large tracts of land to be maintained as natural wetlands. The Federal National Water Bank Program appropriated money to subsidize landowners who will retain water on their land. More important is the deleterious effect on the natural environment generated by drainage programs. Drainage lowers the ground water table, may adversely affect water quality particularly through sedimentation, and destroys recreation areas and wildlife habitat. Drainage need not be stopped but a consideration of the overall environmental impact should be taken into account. Another major problem area is irrigation and water appropriation. Research and regulation are needed to optimize the use of groundwater resources. In addition, eutrophication in lakes has continually accelerated as shore development continues. (Barnes-Florida)
W74-13230

AGRICULTURAL DRAINAGE AND THE PUBLIC INTEREST, (PART I),
Minnesota Dept. of Natural Resources, St. Paul.
W. G. Peterson.
The Minnesota Volunteer, p 37-43, January-February, 1972. 3 illus.

Descriptors: *Agriculture, *Marsh management, *Minnesota, *Drainage effects, *Water resources development, Public benefits, Resource allocation, Natural resources, Ground water resources, Conservation, Resource development, Water supply, Water quality, Mosquitos, Sedimentation, Eminent domain, Taxes, Legal aspects, Water law, Drainage practices, Drainage, Drainage programs, State governments, Federal government, Surface water, Groundwater.

The Minnesota drainage program was conceived in 1883, following several extremely wet summers. It was also a time when there was a shortage of tillable cropland. The drainage program, which consists of a series of taxes and eminent domain proceedings, has been based upon benefitting the general public welfare. Since its inception the Public benefits derived from drainage programs have been highly questionable. Currently, the need for more cropland is questionable since the federal government subsidizes farmers to keep land out of production. Reclaimed marshland is usually poor cropland. The public is not benefitted by less mosquito habitat since malaria carrying mosquitoes occur infrequently in Minnesota. Generally only enough water is romoved to kill mosquito larvae predators, but not the mosquito larvae. Moreover, the detrimental effects on the environment may far outweigh any general public benefits. Although the individual farmer may want wetlands, the effect of rising costs and taxes requires that the farmer increase production to make ends meet. If through use of marginal farm land, many farmers do raise their output, the glut of the market drives prices down. (Barnes-Florida)
W74-13232

SOME REMARKS CONCERNING THE ACTION OF IAA ON TRANSPIRATION EXAMINED AT THE FIRST VEGETATIVE STAGE OF TRITICUM DURUM VAR. OUED ZENATI 368, (IN POLISH),
Instytut Hodowli i Aklimatyzacji Roslin, Warsaw (Poland). Zaklad Biofizyki Roslin.
For primary bibliographic entry see Field 2D.
W74-13259

DESERT PLANTS AS INDICATORS OF LAND FITNESS FOR AGRICULTURAL RECLAMATION, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSSR, Ashkhabad. Institut Botaniki.
B. B. Kerbabaev, and E. A. Ataev.
Probl Osvoeniya Pustyn. 2. p 12-17, 1973, Illus, English summary.
Identifiers: USSR, Arid regions, *Plant indicators, *Land reclamation.

Some plants from piedmont plains in arid regions are indicators of deluvial-proluvial deposits. Change in the relief and soil conditions causes regular changes in plant communities. Data are given on the interrelationship between the vegetation and soil types in the Kopetdagh piedmont plain (USSR). One of the ecological profiles is described in which 5 associations of indicator value are given. Plant communities can be used as indicators by the agricultural reclamation of these lands.--Copyright 1973, Biological Abstracts, Inc.
W74-13261

WATER QUALITY PROBLEMS ARISING FROM IRRIGATION RETURN FLOW,
Bengal Engineering Coll., Howrah (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W74-13322

POLYPHENOLS OF COTTON LEAVES AND THE EFFECT ON THEIR COMPOSITION OF WATER AND NUTRITIONAL STRESS (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre d'Adiopodoume.
J. Brzozowska, P. Hanower, and J. Tanguy.
Phytochemistry (Oxf). Vol 12, No 10, p 2353-2357. 1973. (English summary).

Descriptors: *Cotton, *Phenols, *Plant pathology.
Identifiers: Gossypium-anomalum, Gossypium-thurberi.

A range of phenolic compounds were found in leaves of 3 cottom species (Gossypium anomalum, G. thurberi and a cultivated hybrid). Water and nutrient stress (S deficiency) both caused a significant decrease in phenolic content. Possible interpretations of the observed phenomena are given.--Copyright 1974, Biological Abstracts, Inc.
W74-13344

GUIDELINES FOR RESEARCH ON WATER REQUIREMENTS OF CROPS,
Institute for Applied Research on Natural Resources, Bagdad (Iraq).
J. W. Kijne.
Technical Bulletin 59, April, 1974. 25 p, 4 fig, 17 ref, 3 append.

Descriptors: *Consumptive use, *Irrigation water, *Soil-water-plant relationships, *Water requirements, Crops, Evapotranspiration, Institutions, Instrumentation, Research and development, Research equipment, Research facilities, Research priorities, Universities, Water resources, Water supply.
Identifiers: *Iraq, State Farms.

Since water in Iraq is a limited resource, much interest there now centers on the water requirements of crops. This report considers only irrigation water requirements and discusses the consumptive use of water by crops. Guidelines of recommended research programs for the State Farms and for the Institute for Applied Research on Natural Resources are presented, as is an interdisciplinary program for basic research on evapotranspiration at the major universities of Iraq. Combined effort of the different research units is required in a systematic approach to ascertain the water requirements of crops in Iraq, such research can be done within the present framework of institutions now in operation. Most of the instrumentation for such studies is available at these institutions. (Gloyd-Arizona)
W74-13345

FEASIBILITY STUDY FOR THE ESTABLISHMENT OF DALMAJ PILOT PROJECT,
Institute for Applied Research on Natural Resources, Bagdad (Iraq).
A. H. Al-Rawi, R. Van Aart, J. Dougrameji, G. Toma, and A. A. Al-Khafaji.
Technical Bulletin 61, May, 1974. 152 p, 38 fig, 15 tab, 25 ref.

Descriptors: *Demonstration farms, *Irrigation programs, *Soil investigations, Arid climates, Hydrology, Irrigated land, Irrigation water, Land reclamation, Topography, Costs, Drainage engineering, Irrigation practices, Irrigation systems, Research and development, Soils, Surveys, Water requirement, *Feasibility studies.
Identifiers: *Dalmaj Pilot Project, *Iraq, Massaq region, Soil reclamation, State Farms.

An 80 ha pilot research and demonstration project was established within a State Farm to study soil reclamation and subsequent use of the reclaimed soils for irrigated farming. The 1000 ha State Farm, located along the northern part of the Massaq Main Canal in the Dalmaj Irrigation Project, was surveyed in detail with the expectation that research results could then be applied to other areas of similar environmental conditions. Accordingly, hydrological, topographical, and soil data for both the State Farm and the pilot area are presented, field irrigation and drainage systems are proposed, and research studies in water requirements and improvements in irrigation and drainage practices are recommended. Construction costs for the establishment and operation of the pilot demonstration project are included. (Gloyd-Arizona)
W74-13346

ON APPLICATION EFFICIENCY AND EFFECTS OF TRICKLE IRRIGATION IN A SAND DUNE FIELD (IN JAPANESE),
Tottoir Univ. (Japan). Sand Dune Research Inst.
T. CHO, and T. Yamamoto.
Bulletin No 12, p 20-28, March, 1973. 5 fig, 5 tab, 5 ref. (English summary).

Descriptors: *Arid lands, *Crop production, *Dune sands, Field crops, *Irrigation practices, Irrigation systems, Root zone, Soil moisture, Greenhouses, Lysimeters, Sprinkler irrigation, Testing.
Identifiers: *Trickle irrigation, Sand dunes.

In arid agricultural regions characterized by low water resources and high evaporation rates trickle irrigation has many advantages since high irrigation efficiency is essential. Experiments testing trickle irrigation application efficiency were conducted using small lysimeters in open fields and in a plastic greenhouse. Compared with sprinkler irrigation, trickle irrigation was found to (1) hold the soil moisture content in the root zone of all crops higher than field capacity - 7.4% by volume - during the day, (2) afford an application efficiency of 9 - 39% higher, (3) give crops yields 19 - 25% higher in the open fields and 14 - 68% higher in the plastic greenhouse. (Gloyd-Arizona)
W74-13348

ON THE HYDRAULICS OF THE NOZZLE ON TRICKLE IRRIGATION SYSTEM (IN JAPANESE),
Tottori Univ. (Japan). Sand Dune Research Inst.
T. Cho, T. Yamamoto, and S. Watanabe.
Bulletin No 12, p 13-19, March, 1973. 11 fig, 2 tab, 6 ref. (English summary).

Descriptors: *Hydraulic design, *Discharge(Water), *Irrigation systems, *Nozzles, *Root zone, Water pressure, Crops, Industrial production, Laminar flow, Rational formula, Testing.
Identifiers: *Trickle irrigation, White's empirical formula.

Trickle irrigation, developed in recent years in such arid agricultural areas as Australia, Israel, and the United States, features water under pressure distributed by a series of nozzles near the crop root zone. Here pressure is dissipated, and water drips out at a relatively slow rate. Nozzles, made of polyethylene materials, were trial-manufactured, and hydraulic experiments to demonstrate the effectiveness of the various sizes were conducted. Relationships between pressure and discharge rates of the nozzles were determined by making use of White's empirical formula for the friction factor of laminar flow in curved pipes. It is felt that these determinations can be applied in the design and manufacture of such nozzles for practical use. (Gloyd-Arizona)
W74-13349

ANNUAL REPORT ON GROUND WATER IN ARIZONA, SPRING 1972 TO SPRING 1973,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W74-13350

EFFECT OF FERTILIZATION AND MULCHING WITH BIO-DEGRADEABLE POLYETHYLENE-COATED PAPER ON RESPONSES OF OKRA AND PEPPERS,
Florida Univ., Dover. Agricultural Research Center.
E. E. Albregts, and C. M. Howard.
Hortscience, Vol 8, No 1, p 36-38, 1973.
Identifiers: Capsicum, Ethylene, *Fertilization, Hibiscus, *Mulching, *Okra, *Peppers, Yield, Biodegradation.

Okra (Hibiscus esculentus L. cv. 'Clemson Spineless') and sweet pepper (Capsicum annuum L. cv. 'Yolo Wonger L') were grown at 2 fertility levels with treatments of full bed mulch, strip mulch and bare soil. A black paper coated on both sides with a thin layer of clear polyethylene was used as mulch. Germination okra and the early growth and seasonal marketable yield of both vegetables were greatest with the full bed mulch treatment. The strip mulch treatments increased yield of pepper over that of the unmulched but had little effect on okra yield. Yields were always higher with the higher fertility level, but differences were usually not significant. Pepper fruit size and numbers and okra pods per plant were increased by mulch treatment. As amount of bed covered by mulch increased so did the soil NO3 and K. Higher fertilizer rates generally increased soil NO3 and K but differences were significant only in 1972.--Copyright 1973, Biological Abstracts, Inc.
W74-13370

MERIT, RED ROCK AND POTOMAC: TOMATO VARIETIES ADAPTED TO MECHANICAL HARVESTING,
Agricultural Research Service, Beltsville, Md. Plant Science Research Div.
A. K. Stoner.
U S Dep Agric Prod Res Rep. 144 p 1-4. 1972. Illus.
Identifiers: Fusarium, Lycopersicon, Resistance, Stemphylium, *Tomatoes, Verticillium, Yield, *Mechanical harvesting.

Three mechanically harvestable tomato (Lycopersicon esculentum Mill) Cultivars-'Merit, 'Red Rock' and 'Potomac'-adapted to tomato-producing areas of eastern USA were released. The cultivars yielded over 20 tons of usable fruits/acre in single pickings. The fruits possess good qualities for processing. They are resistant to race 1 of Fusarium wilt, Verticillium wilt and fruit cracking. 'Red Rock' and 'Potomac' are resistant to Stemphylium solani Weber.--Copyright 1973, Biological Abstracts, Inc.

W74-13371

PROLONGED AFTERGLOW OF STRAWBERRY LEAVES AT VARIOUS LEVELS OF HYDRATION, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
For primary bibliographic entry see Field 2I.
W74-13378

ELABORATION OF OPTIMAL DOSES AND FORMS OF MACRO- AND MICROELEMENTS AND HUMATES IN THE NUTRIENT USED IN HYDROPONIC CULTURE'WROCLAW,'
Wroclaw Univ. (Poland). Inst. of Botany and Biochemistry.
Z. Guminska, and M. Gracz-Nalepka.
Acta Agrobot, Vol 25, No 2, p 89-116, 1972. English summary.
Identifiers: Boron, Calcium, Copper, *Humates, Hydroponic, Molybdenum, *Tomatoes, Wroclaw, *Trace elements, *Hydroponics.

The effectiveness of macro- and microelements of modified Hampe solutions was investigated using tomato plants. In general, the original doses and forms of ions were optimal. Nevertheless, a pronounced dependence on external factors was found. In autumn, changes of Mg doses were of no importance. A double Ca dose was optimal at that time. During summer, Cu, B and Mo gave better effects if applied in 10-fold doses. Applying of humate in non-optimal conditions was distinctly advantageous.--Copyright 1973, Biological Abstracts, Inc.
W74-13380

CONTRIBUTIONS TO THE WATER RELATIONS OF OLIVE UNDER SEMI-ARID CONDITIONS,
Ain Shams Univ., Cairo (Egypt). Dept. of Botany.
For primary bibliographic entry see Field 2D.
W74-13382

STUDY OF GROWTH DYNAMICS OF 1-YR SHOOTS OF SEVERAL GRAPE VARIETIES UNDER IRRIGATED AND DRY CONDITIONS IN THE PIEDMONT ZONE OF THE NAGORNO-KARABAKH AUTONOMOUS REGION, (IN AZERBAIJANIAN),
S. G. Magerramov.
Dokl Akad Nauk Az SSSR. 9-10. p 66-69. 1972. Russian summary.
Identifiers: *Grape, Irrigation, *USSR(Karabakh region).

Shoot growth of the cultivars 'Bayan-shirei,' 'Rkatsiteli' and 'Tavriz,' a table grape, proceeded more intensely and for a longer period of time under irrigated than under unirrigated conditions. 'Rkatsiteli' grapes had longer shoots under unirrigated conditions than the other varieties. A study of growth dynamics is significant for the study of biological characteristics and hybridization of grapes.--Copyright 1973, Biological Abstracts, Inc.
W74-13394

GROWTH OF CROP ROOTS IN RELATION TO SOIL MOISTURE EXTRACTION,
Brooms' Barn Experiment Station, Bury St. Edmonds, (England).
M. J. Durrant, B. J. G. Love, A. B. Messem, and A. P. Draycott.
Ann Appl Biol. Vol 74, No 3, p 387-394, 1973. Illus.

Descriptors: *Soil moisture, Moisture availability, Crops, *Crop response, Field crops, Sugar beets, Potatoes, Vegetable crops, Barley, Cereal crops, Crop production.

Growth of the roots of sugar beet, potato and barley in the field was observed through glass panels and related to changes in soil moisture measured by a neutron probe during 1969-71. The depth of observed root growth was generally related to, but 10-15 cm deeper than, the maximum depth of soil-moisture extraction. On average of 3 yr, sugar beet, potato and barley used water from the top 23, 33 and 45 cm soil respectively by the beginning of June and from the top 70, 68 and >100 cm soil by the end of June. Maximum soil drying in each horizon gave an in situ measure of available water capacity and showed that sugar beet and barley eventually extracted similar amounts of water from each horizon, but potatoes estracted less, especially from below 60 cm. Between 30-100 cm deep, the in situ available water capacity (per 10 cm soil) progressively decreased from 16 to 10, 15 to 5 and 16 to 8 mm under sugar beet, potato and barley respectively. The calculated soil-moisture deficit (potential evapotranspiration minus rainfall) and measured soil moisture deficit were not related early in the growing period before the crops established mush leaf cover.--Copyright 1974, Biological Abstracts, Inc.
W74-13414

POTENTIAL PASTURE PRODUCTION IN THE UPLANDS OF WALES: I. CLIMATIC VARIATION,
Welsh Plant Breeding Station. Agricultural Research Council, Aberystwyth(Wales).
J. M. M. Munro.
J Br Grassl Soc, Vol 28, No 2, p 59-67, 1973, Illus.

Descriptors: *Pastures, Grasslands, Rainfall.
Identifiers: *Wales.

A comprehensive study of the climatic, soil and vegetation restraints on grassland production in the hill areas of Britain is an essential preliminary stage in land use planning for those areas. Climatic data, recorded continuously at 4 centers in mid-Wales (United Kingdom), emphasize the extent of altitudinal, topographic, seasonal and diurnal variation in zones with improvement potential. Annual solar energy income is negatively correlated with rainfall and cloud cover. Under wet conditions in the western hills, mean daily solar radiation during 1966-69 decreased by 15% between 2 centers at 30 and 305 m (103 and 1100 ft) O.D. from 9.92 MJ(megajoule)/sq m to 7.07 MJ/sq m (204-169 cal/sq cm). Radiation receipts in the drier eastern uplands at 305 m (1000 ft) were as high between May and Aug. as in the western lowlands, but winter temperatures were considerably lower. Comparisons are made with conditions in other upland areas of Britain.--Copyright 1974, Biological Abstracts, Inc.
W74-13454

EFFECT OF STRAW AS A FERTILIZER ON RICE YIELD, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
V. R. Rao.
Izv Akad Nauk SSSR Ser Biol. 3, p 420-422, 1973. English summary.

Descriptors: *Rice, *Mulching, *Fertilizers.
Identifiers: *Straw.

Application of rice straw increased crop yield of rice, especially when the straw was applied in the upper (0-6 cm) layer of soil. An increase of 30% yield was observed. In greenhouse studies straw was applied at 2 doses representing 5-10 tons/ha. Nitrogenous fertilizers significantly increased the yield of rice. However, with the combined application of straw and mineral fertilizers in the upper layer of soil additional response in the rice yield was recorded (about 40-50%). The beneficial effect of straw as a fertilizer is presumably due to the supplementry N accumulation by N fixers, which utilize the decomposition products of cellulose. Under water-logged conditions the decomposition of cellulose is manifested by both aerobic and anaerobic microorganisms.--Copyright 1974, Biological Abstracts, Inc.
W74-13455

PHOTOSYNTHESIS, DIFFUSION RESISTANCE AND RELATIVE PLANT WATER CONTENT OF COTTON AS INFLUENCED BY INDUCED WATER STRESS,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
D. G. Harris.
Crop Sci. Vol 13, No 5, p 570-572, 1973. Illus.

Descriptors: *Photosynthesis, *Transpiration, *Moisture stress, *Cotton.

Frequent and simultaneous measurements of photosynthesis, transpiration and relative plant water content were made on large cotton (Gossypium hirsutum L. 'Empire') plants. Measurements were made after adding polyethylene glycol to the nutrient solution to induce plant water stress. Reducing the solution water potential by 0.5, 1.0 and 2.0 bars had no observable effect upon the plant. The 4.0-bar treatment reduced photosynthesis, transpiration and relative plant water content of a 97-day-old plant. The effect of the 4.0-bar treatment diminished as plant maturity increased and no residual effect of the treatment was detected after 48 hr of recovery in a standard nutrient solution.--Copyright 1974, Biological Abstracts, Inc.
W74-13457

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

MICHIGAN'S EXPERIENCE WITH UTILIZING THE TEN STATES GUIDELINE FOR LAND DISPOSAL OF WASTEWATER,
Michigan Dept. of Public Health, Lansing. Div. of Wastewater.
For primary bibliographic entry see Field 5D.
W74-12898

FOREST SERVICE POLICY RELATED TO THE USE OF NATIONAL FOREST LANDS FOR DISPOSAL OF WASTEWATER AND SLUDGE,
Forest Service (USDA), Washington, D.C. Div. of Watershed Management.
For primary bibliographic entry see Field 5D.
W74-12899

FORECASTING DISCHARGE FROM A GLACIATED BASIN IN THE SWISS ALPS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
For primary bibliographic entry see Field 2C.
W74-12974

SURFACE WATER RESOURCES OF THE USSR AND THEIR CHANGE UNDER THE EFFECT OF INDUSTRIAL AND AGRICULTURAL ACTIVITY,
K. P. Voskresenskiy, A. A. Sokolov, and I. A. Shiklomanov.
Soviet Hydrology, Selected Papers No 2, p 123-142, 1973. 14 tab, 22 ref. Translated from Water Resources (Vodnyye resursy), No 2, p 33-57, 1973.

Descriptors: *Water resources, *Surface water availability, *Hydrologic data, *Water utilization, *Water supply, Hydrologic aspects, Hydrology, Industrial water, Lakes, Reservoirs, Glaciers, Runoff, Irrigation water, Domestic water.
Identifiers: *USSR.

The water resources of the Soviet Union comprise river runoff, waters accumulated in lakes and reservoirs, glaciers, snow cover and ground-

waters. The surface water resources of the USSR amount to about 42,000 cu m and the surface runoff amounts to 4714 cu m in an average year. The locations and distributions of surface water resources are discussed as well as their changes resulting from industrial and agricultural activity. The surface water resources will not undergo significant changes in the next 20-30 years, and their possible decrease will be insignificant. The effect of industrial activity will be stronger in the future in individual regions and river basins of the arid zone. The runoff of the northern rivers of the European USSR and of Siberian rivers will have to be diverted to the south in the next 20-30 years for the further development of industrial activity in these regions. (Humphreys-ISWS)
W74-12983

PROBABILITY DISTRIBUTION OF OUTFLOW FROM A LINEAR RESERVOIR,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
V. Klemes.
Journal of Hydrology, Vol 21, No 4, p 305-314, 1974. 1 fig, 5 ref.

Descriptors: *Hydrologic systems, *Reservoir storage, *Stochastic processes, Probability, Markov processes.
Identifiers: Probability distribution, Random numbers, *Linear reservoirs.

The probability distribution of output from a linear reservoir was derived for a random and a first-order Markovian input. In the first case it was expressed in terms of the input distribution; in the second case, in terms of the distribution of its random component. The analytical solutions showed how a particular deterministic system transforms a particular stochastic input thereby contributing to system identification. (Terstriep-ISWS)
W74-13001

DETERMINISM AND STOCHASTICITY IN HYDROLOGY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-13010

QUASI-BIENNIAL STREAMFLOW VARIATION IN THE USSR,
For primary bibliographic entry see Field 2A.
W74-13011

LINEAR DECISION RULE: A NOTE ON CONTROL VOLUME BEING CONSTANT,
Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
S. C. Nayak, and S. R. Arora.
Water Resources Research, Vol 10, No 4, p 637-642, August 1974. 1 fig, 1 ref.

Descriptors: *Reservoir releases, *Control, *Volume, *Storage capacity, *Management, *Linear programming, Reservoir storage, Floods, Droughts, Constraints, Equations, Decision making, Optimization, Systems analysis, Mathematical models.

Using the linear decision rule of Revelle et al. (see W69-09459) for the release management of reservoirs, the problem of finding an optimal reservoir storage capacity is considered; capacity requirements for flood and drought periods are dealt with. Studied in detail is the phenomenon of control volume, and the assumptions under which control volume stays constant are clarified. (Bell-Cornell)
W74-13019

DRAINAGE SYSTEM DESIGN AND ANALYSIS BY COMPUTER,
Soil Conservation Service, Portland, Oreg.
D. M. Renner, and C. C. Mueller.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 100, No IR3, Proceedings paper No 10801, p 255-265, September 1974. 8 fig, 1 tab, 11 ref.

Descriptors: *Drainage systems, *Subsurface drainage, *Design, *Computer programs, *Equations, *Irrigated land, Tile drains, Water table, Costs, Depth, Hydraulic conductivity, Washington, Systems analysis.
Identifiers: *Transient flow method, Drain spacing, System layout, Sensitivity.

The conditions needed for the theoretical mathematical solution in the design of subsurface drainage systems are usually hard to find in the field. An optimum system design cannot be obtained without knowledge of the correct inputs to the drainage design equation. Two programs are presented for using the computer to design subsurface drainage systems for irrigated areas. The first calculates drain spacings using the Dumm, Moody, and Tapp nonsteady-state transient flow method, which provides close correlation between theory and practice. The second program provides drainage system layouts in an area requiring drainage for any specified drain spacing and drain depth. Using these two programs, all input parameters can be investigated and the effect of their variance on both drain spacing and system cost can be found. Thus, a sensitivity relationship between the drain spacing and system layout, and the parameters used in calculating the spacing, can be defined. (Bell-Cornell)
W74-13021

OPTIMIZED DESIGN OF A SUBSURFACE DRAINAGE SYSTEM,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
E. H. Wiser, R. C. Ward, and D. A. Link.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 1, p 175-182, February 1974. 3 fig, 1 tab, 15 ref.

Descriptors: *Subsurface drainage, *Drainage systems, *Tile drainage, *Design, *Simulation analysis, *Crop response, *Water table, *Water balance, Optimization, Depth, Economics, Benefits, Costs, Methodology, Research, Damages, Hydrologic data, Flooding, Rainfall, Information, Model studies, Systems analysis.
Identifiers: Spacing, Assumptions.

Described is a technique for evaluating optimum values of depth and spacing for a uniform subsurface drainage system. The objective is to maximize the amount by which system benefits exceed costs. System benefits are classed as increased yield and quality of crops, and improved working conditions. System costs consist of the fixed cost of the system itself and the annual maintenance and crop production costs. Using the technique, a subsurface drainage system was designed for a silt loam soil to be grown to alfalfa in central North Carolina. Described is a model for pulse inputs of rainfall for simulating water table fluctuation, using available climatological data. Also described are a water balance model and a model for the effect on plant growth. Consideration is given to sources of error in the assumptions and to alternative models that would lead to more reliable results. It is shown that a single optimum design can be obtained. If some depth variation is necessary, spacing can be modified to obtain net returns near the optimum. (Bell-Cornell)
W74-13025

SOME PROBLEMS ON THE STOCHASTIC FLOOD CONTROL,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
Y. A. Rozanov.
Report 74-13, June 1974. 6 p, 1 ref.

Descriptors: *Flood control, *Probability, *Reservoirs, *Storage capacity, *Flow, Stochastic processes, Equations, Water transfer, Constraints, Inflow, Control, Optimization, Markov processes, Hydrologic aspects, Systems analysis, Mathematical models.

A system of reservoirs is connected in such a way that an amount of water can be transferred from one reservoir to another during a specified time period and to the outside where control parameters limit the maximum or minimum allowable flow. Considered is the problem of accumulating water during some time period and choosing the optimal control parameter which will minimize the mean square expected value of deviations from target storage volumes. (Bell-Cornell)
W74-13029

A STUDY OF HOW WATER QUALITY FACTORS CAN BE INCORPORATED INTO WATER SUPPLY ANALYSIS,
Ernst and Ernst, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-13030

ANALYSIS OF URBAN LAND TREATMENT MEASURES FOR FLOOD PEAK REDUCTION,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
A. M. Lumb, J. R. Wallace, and L. D. James.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 418 $5.75 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC-0574, June 1974. 146 p, 33 fig, 17 tab, 35 ref, 3 append. OWRT C-2064(3359)(3).

Descriptors: *Urban hydrology, *Storm runoff, Land use, Floods, *Flood routing, *Computer models, *Land management, Storage, Channels, Terracing, Landscaping, Grassed waterways, Model studies, Watershed management, Drainage, Urban runoff.
Identifiers: Watershed models, Flood models.

Two computer models for urban hydrologic studies were developed. The Small Urban Watershed Flood Hydrograph Model is to study how flood hydrographs are affected by the arrangement of buildings and paved areas on small watersheds. Storm runoff is simulated from the physical characteristics of (1) small homogeneous land areas averaging about one quarter acre in size and (2) channel sections. The Urban Hydrograph Routing Model is to study how flood hydrographs are affected by the distribution of land uses in larger watersheds, changes in impervious area, and channel characteristics. Applications of these models showed that (1) small detention storage basins are effective in holding runoff from newly developed areas to their former peaks under natural conditions but become progressively less effective with increasing watershed size, (2) using natural instead of paved collector channels has a similar pattern of substantially reducing head-water hydrographs but diminishing effectiveness as one goes downstream, (3) draining roofs and driveways onto dense turf is effective immediately downstream and, because of volume reductions, may cumulatively have a greater effect in larger watersheds, (4) terracing is effective if dense turf is maintained but bare dirt terraces probably do not justify their costs, and (5) commercial and industrial areas accentuate flood hydrographs most when located near the middle of a watershed.
W74-13043

DECISION MAKING UNDER UNCERTAINTY: ECONOMIC EVALUATION OF STREAMFLOW FORECASTS,
Michigan Univ., Ann Arbor. School of Natural Resources.
G. Schramm, R. W. Fenton, J. L. Moore, D. Hughart, and G. R. Moore.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 417 $10.50 in paper copy, $2.25 in microfiche. Completion Report, July, 1974, 422 p, 29 fig, 64 tab, 89 ref. OWRT C-1140(1588)(3).

Descriptors: *Streamflow forecasting, *Economic prediction, *Risks, *Decision making, *Estimated benefits, *Idaho, *Wyoming, Snowmelt, Irrigation, Model studies, *Reservoir operation, *Economic efficiency, Computer models, Project benefits.
Identifiers: Snake River(Ida-Wyo), Palisades-Jackson Reservoir(Ida-Wyo), *Forecasting errors.

The research focuses on the potential economic benefits that could accrue to different classes of water users as a result of improvements in the accuracy of streamflow forecasts. Detailed efforts for the evaluation of the economic benefits from improved streamflow forecast accuracy were concentrated on water use activities that depend substantially on snowmelt runoff. The first part of the study qualifies the approximate benefits to a typical western U.S. irrigation area from improved seasonal streamflow forecasts through the use of a probabilistic linear programming model. This model serves to allocate a region's crop acreages, so as to maximize the expected income of planting associated with each forecast. Results from testing the model indicate gross benefits ranging from a few cents per acre up to $6.00 per acre. The second part of the study analyzes the effect that more accurate forecasting would have on the efficiency of multiple purpose water reservoirs. An investigation was made of the causal relationship between errors in streamflow and water supply forecasts and any resulting inefficient reservoir operation. To estimate the benefit of avoiding these inefficiencies through improvements in streamflow forecasting, a computer simulation model was developed. The model represents a first attempt to combine a hydrologic forecasting routine capable of generating forecasts of varying degrees of accuracy with a reservoir operating model reflecting the objectives of the operator and the constituents of the water service area, and the social and political constraints. The model allocates joint-use storage space in the reservoir on the basis of a Flood Control Reservation Diagram and daily forecasts of remaining season runoff and daily streamflow over the next thirty day period. This operations model is based on the Palisades-Jackson Reservoir complex on the Snake River in Idaho and Wyoming. The results indicate that significant benefits may be derived from improved seasonal water supply forecasts if the economic values in the water service area are significant. Additional major benefits of forecasting improvements are likely to arise in situations where the operating procedures of existing reservoirs are revised by reducing flood storage requirements in line with reductions in likely forecast errors.
W74-13044

RESERVOIR PROJECT REAUTHORIZATION: EXAMPLES OF PAST USE AND ANALYSIS OF APPLICATION TO LAKE LANIER,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
K. R. Holley, and E. P. Kane.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 408 $6.25 in paper copy $2.25 in microfiche. ERC-1374, August 1974. 161 p, 3 fig, 12 tab, 80 ref.

Descriptors: Water supply, Power operation and maintenance, *Reservoir operation, Flood control, Electric power, *Water allocation(Policy), *Recreation, *Institutional constraints, Financial feasibility, *Georgia, Legislation, State governments, Municipal water.
Identifiers: *Congressional reauthorization, *Lake Lanier(Geo), Atlanta(Geo).

Congressional reauthorization is required if it is desired after a large reservoir is constructed to change the operating rules to shift use of the facility among the various possible purposes. As demands for water continue to increase, as fewer economical reservoir sites remain, and as reservoir construction becomes increasingly restricted by environmental and social considerations, more and more attention will have to be placed on revising the use of existing as opposed to building new facilities. The first part of this report described historical cases of Congressional reauthorization. Seven situations in which reservoirs went through the reauthorization process and nine cases to be studied under Public Law 91-611 are outlined. Reallocation of storage space from flood control to water supply has been the most common change. The second part of this report appraises the situation in which metropolitan Atlanta, Georgia, needs additional water and Lake Lanier is now used for other purposes but appears to be one of the more attractive alternatives. Effects of the change on recreation benefits and on institutional and financial arrangements are discussed. The evaluation found that conversion of the current storage allocation from hydroelectric power to municipal water supply seems to be the most promising alternative and can probably be accomplished at minimal sacrifice in flood control and recreation benefits. (James-Georgia Tech)
W74-13046

THE RELATIONSHIP OF LAND USE TO DOMESTIC SURFACE WATER SUPPLY IN GEORGIA,
Georgia Univ., Athens. School of Forest Resources.
W. L. Nutter, and D. W. Shaw.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 429 $4.25 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC-0873, June 1973. 53 p, 5 fig, 5 tab, 13 ref, 3 append. OWRT A-039-GA(1), 14-31-0001-3510.

Descriptors: Water resources, *Water supply, Water users, Water quality, *Watershed management, Water treatment, Watersheds(Basins), *Water utilization, *Domestic water, Land tenure, *Land use, *Surface water availability, *Georgia, Water treatment.
Identifiers: Piedmont Province, Blue Ridge Province, Valley Province, Fall-line.

A questionnaire and interview procedure was used to identify all the sources of surface water supply and land use related water quality problems in Georgia. One-hundred and six watersheds provide raw water to 97 treatment systems which in turn supply 154 communities and institutions with a population of 2.69 million. All the watersheds are north of the fall-line in the piedmont and mountain provinces of the state. Each watershed boundary and intake point are identified on a map. Approximately 23 percent of the watersheds are less than 5 square miles and 68 percent are less than 100 square miles in area. Forest logging, agricultural cropping and pasturing, and recreation related activities were the watershed uses most frequently cited as sources of water quality problems. No cases were cited of communities attempting to control upstream practices affecting water quality, although in a few cases where the abusive practice ceased, raw water treatment costs were reduced by one-third. No community in Georgia owns its entire watershed. Two communities have special use agreements with the U.S. Forest Service for water supply and 9 communities depend on land use measures and reservoirs of the P.L. 566 Small Watershed Program of the U.S. Soil Conservation Service.
W74-13047

MAN AND WATER, THE SOCIAL SCIENCES IN MANAGEMENT OF WATER RESOURCES.
Kentucky Univ., Lexington. Water Resources Inst.
For primary bibliographic entry see Field 6B.
W74-13058

ANTHROPOLOGICAL CONTRIBUTIONS TO THE CULTURAL ECOLOGY AND MANAGEMENT OF WATER RESOURCES,
Washington Univ., Saint Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 6B.
W74-13060

ROLE OF GEOGRAPHY IN WATER RESOURCES MANAGEMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6B.
W74-13062

THE IMPACT OF MAN-MADE LAKES ON RESIDENTIAL PROPERTY VALUES: A CASE STUDY AND METHODOLOGICAL EXPLORATION,
Toronto Univ. (Ontario), Dept. of Geography.
For primary bibliographic entry see Field 6B.
W74-13066

SPECIAL FLOOD HAZARD INFORMATION REPORT: DRY CREEK, DOUGHERTY COUNTY, GEORGIA.
Army Engineer District, Mobile, Ala.
Prepared for Dougherty County, August 1971, 10 p, 2 fig, 1 tab, 4 plates.

Descriptors: *Floods, Flooding, Floodplains, *Flood control, Flood protection, *Georgia, Sinks.
Identifiers: *Dry Creek(Ga.), Dougherty County(Ga).

Dry Creek, located 8 miles south of Albany, Georgia, flows through mostly agricultural land. Its basin, draining a total of 68 square miles in 3 counties, is flat in the lower reaches becoming hilly in the headwaters. Numerous limestone sinkholes and depressions are located throughout the basin making the channel hard to find in periods of low flood. Banks of both Dry Creek and the South Fork of Dry Creek are low, channel widths are about 30 feet in lower reaches and the streams slope about 9 feet per mile allowing wide areas of the floodplain to be covered when flooding occurs. Six bridges span the creek. Flood producing storms occur during winter and spring; however, thunderstorms may cause localized flooding at any time. Damage to crops and roads has occurred due to past flooding. No floodplain management program has been proposed, although the potential for increased residential and industrial development in Dougherty County indicates there will be a greater demand for building sites in the floodplain, and a program of flood damage reduction is highly desirable. Because of sinkholes and depressions which result in local ponding not attributed to stream overflow, it is suggested that local foundation conditions should be determined before building load bearing structures in the basin. Preparation of maps showing potential flooded areas was not considered practical. However, by using plates showing contour elevations for the reaches of Dry Creek plus high water profiles, the approximate depth of flooding along the creek by the 50 and 100 year flood can be determined. (Salzman-North Carolina)
W74-13067

FLOOD PLAIN INFORMATION: SOPE CREEK, VICINITY OF MARIETTA, GEORGIA.
Army Engineer District, Mobile, Ala.
Prepared for the Atlanta Region Metropolitan Planning Commission, March, 1973. 16 p, 4 fig, 7 tab, 8 plates.

Descriptors: *Floods, *Flooding, *Floodplains, *Floodplain zoning, Flood control, Flood protection, *Georgia.
Identifiers: *Sope Creek(Ga), Marietta(Ga), Cobb County(Ga).

Sope Creek, a tributary of Chattachoochee River, which slopes at an average of 26.8 feet per mile, has a channel width ranging from 15 to 50 feet and has banks 3 to 15 feet high, flows through Marietta, the county seat of Cobb County located northwest of Atlanta. Varying in width from 200 to 500 feet, the floodplain ranges from being moderately developed in the city of Marietta, to relatively undeveloped in outlying areas. Generally the Creek flows along the edge of residential subdivisions. Gage records, newspaper files and interviews provided data. Frontal type storms during the winter and spring cause most of the floods lasting 2 to 4 days. Summer thunderstorms cause high intensity flooding over small areas. Both natural and man-made obstructions including 18 bridges and their approach embankments impede flood flows. No flood control measures exist. Cobb County zoning ordinances state that no structure shall be located in areas subject to flood damage; however, it is being revised. Only limited information concerning past floods is available possibly due to sparse development in the floodplain. Floods of 1971 and 1972 caused damage to homes and property. Intense combinations of rainfall and run-off could create an Intermediate Regional Flood with a peak discharge of 10,690 cubic feet per second (cfs) at Sope Regional Flood with a peak discharge of 10,690 cubic feet per second (cfs) at Sope Creek's mouth and a Standard Project Flood of 22,910 cfs. Hazardous conditions would exist on the floodplain resulting in property damage as well as flooding of sanitary sewer lines and sewage treatment facilities. (Salzman-North Carolina)
W74-13068

FLOOD PLAIN INFORMATION, LITTLE NESHAMINY CREEK, BUCKS COUNTY, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
Prepared for the Bucks County Planning Commission, November, 1973. 25 p, 5 fig, 7 tab, 10 plates.

Descriptors: *Flooding, *Floodplains, *Flood control, Flood damage, Historic floods, Dams, *Pennsylvania.
Identifiers: *Little Neshaminy Creek(Pa), Bucks County(Pa).

The floodplain covers an area from Richland, Pennsylvania where little Neshaminy Creek merges with Neshaminy Creek to the Bucks-Montgomery County Line. The watershed area of 43 square miles is primarily agricultural land but the expansion of Philadelphia pressures the development of the floodplain with commercial and residential properties. The stream has low banks and numerous natural obstructions. Floods occur in all seasons caused by snowmelt in the winter and heavy hurricane-caused rains which increase summer run-off. A small dam on the Creek has no flood control capacity. Two proposed Soil Conservation Service dams could reduce the Intermediate Regional Flood (IRF) by 50%. Two small communities within the floodplain, Warrington Township and Northampton Township, have floodplain zoning ordinances. In some areas the stream alignment has been straightened and the channel widened. The greatest flood occurred August 19, 1955 cresting at 63.4 feet, mean sea level. The most recent flood occurred November 9, 1972 cresting at 55.6 feet, and resulted in property damage to roads and homes. An IRF, cresting at 153.6 feet would inundate the entire floodplain causing hazardous conditions. A Standard Project Flood (SPF) would have nearly twice as much discharge as an IRF, with greater water velocity, thereby affecting a greater portion of development. This report furnishes a basis for the adoption of land use controls to guide floodplain management. (Salzman-North Carolina)
W74-13069

SPECIAL FLOOD HAZARD INFORMATION REPORT, CHATTAHOOCHEE RIVER, ROARING BRANCH, WERACOBA CREEK AND LOWER BULL CREEK, VICINITY OF COLUMBUS, GEORGIA.
Army Engineer District, Mobile, Ala.
Prepared for Lower Chattachoochee Valley Area Planning and Development Commission, August, 1971. 11 p, 1 tab, 12 plates.

Descriptors: *Floods, *Flooding, *Flood control, *Georgia, Floodplains, Dams, Flood protection, Historic floods, *Alabama.
Identifiers: Columbus(Ga), Phenix City(Ala), *Chattahoochee River(Ga), Roaring Branch(Ga), Weracoba Creek(Ga), Lower Bull Creek(Ga).

Chattahoochee River flows through Columbus, Georgia and its neighboring city across the river, Phenix City, Alabama. Weracoba Creek, formed north of Columbus, flows into Bull Creek which flows into Chattahoochee River. Roaring Branch flows for four miles through hilly undeveloped terrain with a slope of 40 feet per mile before entering into Chattahoochee River. Bull Creek, a larger stream, has a moderately developed floodplain. Weracoba Creek, running through highly urbanized areas of Columbus, is contained within several culvert systems as well as being crossed by roads. Because of these developments the natural channel is non-existent and flow is controlled by man-made structures. Under these conditions, widespread shallow flooding occurs throughout the drainage basin. The width of the Chattahoochee River in vicinity of Columbus is 400 to 600 feet with banks 20 feet high. The average slope of the river is 10 feet per mile. West Point Dam, 37 miles upstream from Columbus reduces flood stages. Flood producing frontal type storms generally occur from December to April taking several days and cover large areas. Summer storms are of shorter duration but higher intensity over smaller areas. Flooding of lowlands south of Columbus occurs twice annually. The highest flood occurred on March 1929 cresting at 328 mean sea level. The most recent flood was on March 1966. An Intermediate Regional Flood (IRF) would meet the level of the March 1929 flood, and a Standard Project Flood (SPF) would be 6 feet higher. Both would cause damage to development in the floodplain. No flood plain zoning regulations exist. (Salzman-North Carolina)
W74-13070

APPLICATION OF REMOTE SENSING TO STATE AND LOCAL GOVERNMENT (ARSIG),
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6F.
W74-13140

APPLICATION OF REMOTE SENSING TECHNIQUES IN LAND USE PLANNING: FLOODPLAIN DELINEATION,
Cochise County Planning Dept., Ariz.
R. B. Clark, and J. Altenstadter.
Office of Arid Land Studies, University of Arizona, Tucson, Arizona, OALS Bulletin 6, July 1974. 22 p. 6 fig, 2 tab, 6 ref. NASA Grant NGL 03-002-313.

Descriptors: *Flood plain zoning, *Land use, *Remote sensing, *Project planning, Flood data, Soils, Soil stability, Vegetation, Arid lands, Regional development, Hydrologic data, Geomorphology, Watersheds(Basins), Maps, *Arizona.
Identifiers: Earth Resources Technology Satellite(ERTS-1), Cochise County(Ariz).

A floodplain delineation project was conducted by the Cochise County Planning Department in southern Arizona in response to legislation passed in Arizona in 1973, requiring local governments to outline 100-year floodplains in areas of current land development and to construct ordinances for land use management in these areas. The project employed imagery from the Earth Resources Technology Satellite (ERTS-1) and high altitude aircraft to determine areas of potential flooding. Results of this project were a set of base map overlays delineating areas requiring special regulation, together with county-wide maps of watershed configurations and soil hydrology groups. Data from this project and subsequent projects will be presented to the County Board of Supervisors for use in development of subdivision regulation ordinances. (Mastic-Arizona)
W74-13142

INTERRELATIONSHIPS BETWEEN QUANTITATIVE GEOMORPHIC CHARACTERISTICS OF THE DRAINAGE BASINS IN SUB-HUMID TO HUMID ENVIRONMENT OF RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
S. Singh, and B. Ghose.
Annals of Arid Zone, Vol 12, No 1 and 2, p 82-99, March and June, 1973. 27 fig, 1 tab, 2 ref.

Descriptors: *Model studies, *Drainage systems, *Sediment yield, *Geomorphology, *Channel morphology, Small watersheds, Water yield, Watersheds(Basins), Streams, Hydrologic properties.
Identifiers: *India.

A study of 15 small agricultural drainage basins has shown that certain of their morphological characteristics are interrelated to basic hydrologic properties of the streams. From these relationships contributions can be made toward estimations of water and sediment yields. Results are not directly applicable to the arid and semi-arid parts of the country, because of variations in geologic formations and climatic conditions. This study has attempted to correlate the known morphometric characteristics to the humid and sub-humid environment where the study occurred, to help in appraisal and exploitation of water resources. The determination was made that basins with higher values of stream frequency and other factors are circular; the lower values are present in elongated basins. (Mastic-Arizona)
W74-13147

DRAINAGE AND LAND RECLAMATION IN THE LOWER MESOPOTANIAN PLAIN,
International Agricultural Centre, Wageningen (Netherlands).
R. Van Aart.
Nature and Resources, Vol 10, No 2, p 11-17, April-June, 1974. 3 fig, 1 tab.

Descriptors: *Drainage, *Saline water-freshwater interfaces, *Land reclamation, *Desalinization, *Saturated soils, Saline soils, Salt tolerance, Alkali soils, Crop response.
Identifiers: *Irag(Persian Gulf).

Presented are results of survey and research work to be used in developing methods for land reclamation and consequent development of soils in the Mesopotamian valley in Irag. Major problems include waterlogging and salinization of the land by intrusion of saline water from the Arabian Gulf due to high tides. Solutions consist of drainage by control and lowering of the groundwater table followed by desalinization and dealkalinization, and finally reclamation through adequate crop-growth by means of a change in cropping patterns of existing crops and introduction of new crops. (Mastic-Arizona)
W74-13148

ARIZONA'S WATER RESOURCES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6D.
W74-13152

UTILIZATION OF DISUSED COAL MINES AS WATER STORAGE RESERVOIRS,
Teesside Polytechnic, Middlesbrough (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-13164

FLOOD OF JUNE 1964 IN THE OLDMAN AND MILK RIVER BASINS, ALBERTA,
Department of the Environment, Ottawa, (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2E.
W74-13173

QUANTITATIVE AND HISTORICAL EVIDENCE OF VEGETATION CHANGES ALONG THE UPPER GILA RIVER, ARIZONA,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 3B.
W74-13174

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT: VOLUME 4. HYDROGRAPH ANALYSIS,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
For primary bibliographic entry see Field 2E.
W74-13177

FLOODS OF JUNE 1972 IN THE HARRISBURG AREA, PENNSYLVANIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13186

FLOOD OF MARCH 1968 ON THE NEPONSET RIVER, MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13187

FLOODS IN CAPRON QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13188

FLOODS IN GARDEN PRAIRIE QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13189

FLOODS IN HARVARD QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13190

WATER RESOURCES OF THE MAUMEE RIVER BASIN, NORTHEASTERN INDIANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13191

FLOOD OF MARCH 1968 ON THE IPSWICH RIVER, MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13194

FLOOD SURVEYS ALONG TAPS ROUTE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 2E.
W74-13198

FLOODS OF JUNE 1965 IN ARKANSAS RIVER BASIN, COLORADO, KANSAS, AND NEW MEXICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2E.
W74-13207

RED BOILING SPRINGS WATERSHED PROJECT, MACON AND CLAY COUNTIES, TENNESSEE, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
Available from National Technical Information Service, Springfield, Va 22161 as EIS-TN-73-1701-F, $4.25 paper copy, $2.25 microfiche. October 25, 1973. 58 p, 3 fig, 4 tab.

Descriptors: *Environmental effects, *Watershed management, *Tennessee, *Federal government, *Flood control, Floods, Flooding, Water management(Applied), Flood plains, Flood protection, Watersheds(Divides), Flood plain zoning, Nonstructural alternatives, Southeast US, Appalachian Mountain Region, Watershed Protection + Flood Prevention Act, Erosion control, Sediment control, Flood damage, Land management, Soil conservation, Conservation, Water policy, Water resources development.
Identifiers: *Environmental Impact Statements, Macon + Clay Counties(Tenn), *Dam effects.

This project is located in Macon and Clay Counties, Tennessee. The plan proposes conservation land management for 2,450 acres, construction of five floodwater retarding structures with measures to preserve the downstream fishery habitat, and flood plain zoning in low-lying areas. The flood plain comprises six percent of the watershed. Most of the watershed is forest or pastureland. Damaging floods occur in the agricultural areas two or three times a year. Floods large enough to damage residential or commercial properties occur about once every five years. The project will significantly reduce erosion and floodwater damage. Fifty-five acres of wildlife habitat will be permanently inundated, 107 acres will be needed for construction, and 78 acres will be temporarily flooded. Land management techniques, purchase of flood plain land, flood-proofing and flood plain zoning, and channel modification were deemed ineffective solutions to the flood problem. The proposed project is compatible with the present and long-term objectives of the sponsors. There is no significant opposition to this project. (Deckert-Florida)
W74-13223

ALPINE LAKE PROJECT ALPINE, TEXAS, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Albuquerque, N. Mex.
Available from National Technical Information Service, Springfield, Va 22161 as EIS-TX-73-1406-F, $3.75 paper copy, $2.25 microfiche. August 27, 1973. 41 p, 3 map.

Descriptors: *Environmental effects, *Dam construction, *Multiple-purpose projects, *Reservoir construction, *Texas, Southwest U.S., Reservoirs, Dams, Flood control, Flooding, Flood protection, Check structures, Diversion structures, Dikes, Water supply, Water management(Applied), Watershed management, Recreation, Water resource development, Recreation facilities, Flood routing, Water supply development, Federal government, Flash floods, Conservation.
Identifiers: *Environmental Impact Statements, *Alpine(Tex), Dam effects.

This project calls for construction of multi-purpose floodwater retarding structures to provide storage for a municipal and industrial water supply, recreation, and flood control. The improvements would be constructed immediately south of the city limits of Alpine, Texas, and would affect the Alpine, Paisano, and West Mores creeks. The region is semi-arid and subject to flash flooding during summer months. The project would reduce flooding and provide a small permanent pool for recreation and fishery enhancement. 784 acres of grazing land currently used as wildlife habitat by coyotes and jackrabbits would be lost due to inundation and changed land use. Channelization, detention structures, diversions, flood plain enlargement and combinations thereof, and no action were deemed inadequate alternatives. Other than the inundation of the 784 acres, no irreversible commitment of resources is required and the relationship between short-term uses and long-term productivity is highly favorable. Local, state and federal agencies support the project and there is no significant opposition. (Deckert-Florida)
W74-13224

TREXLER LAKE, JORDAN CREEK, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
Available from National Technical Information Service as EIS-PA-73-1430-F $6.25 paper copy, $2.25 microfiche. August 30, 1973. 174 p, 14 fig, 12 tab.

Descriptors: *Environmental effects, *Multiple-purpose reservoirs, *Dam construction, *Water supply, *Economic effects, Delaware River Basin Commission, Rivers, River basins, Reservoirs, *Pennsylvania, Flood protection, Water shortage, Recreational facilities, Wildlife habitat, Flood control, Dams, Reservoir operation, Reservoir yield, Flow control, Human population, Community development, Industries, Federal government, Administratiive agencies.
Identifiers: *Environmental Impact Statements, National Environmental Policy Act, *Allantown(Pa).

The Trexler project proposes to construct a dam across the Jordan Creek creating a lake with a surface area of 1220 acres. It would be located on farmland in the Lehigh Valley just north of Allantown, Pennsylvania. The project would solve the problems of floods and water shortage, and would provide additional employment and recreational facilities. The area is rapidly populating and industrializing, which increases the demand for water. The project, which will alter the environment, will require relocation of roads, and telephone and power lines. Displaced wildlife are expected to emmigrate into a new range. Adverse effects include conversion of a free-flowing stream to slack water, loss of farmlands, decrease of taxable lands, elimination of a wildlife habitat, limitation of the Trexler Game Preserve, and modification of existing scenery. Alternatives including no action, location of a similar project elsewhere, construction of a series of small reservoir, and regulation of flood plain development were not chosen due to cost and lack of efficacy. The long-term productivity would provide public access to recreational opportunities, increased water supply, and reduced flood damage. No irreversible measures are proposed except labor, materials and excavation of the spillway. (Dillingham-Florida)
W74-13225

THIMBLE SHOAL CHANNEL (MAINTENANCE DREDGING) (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
Available from National Technical Information Service as EIS-VA-73-1471-F, $3.75 paper copy, $3.75 microfiche. September 7, 1973. 34 p, 2 tab, t map.

Descriptors: *Environmental effects, *Dredging, *Sediment control, *Chesapeake Bay, *Rivers and Harbors Act, Channel improvement, Spoil banks, Turbidity, Inlets(Waterways), Federal government, Aquatic environment, Water quality, Water

pollution effects, Benthic flora, Benthic fauna, Harbors, Inland waterways, Sediment-water interfaces, *Virginia.
Identifiers: *Environmental Impact Statements, Coastal waters, Coastal zone management, National Environmental Policy Act, Spoil disposal(Offshore).

This project was originally adopted by the Rivers and Harbors Act of 1910. It is located in the lower portion of the Chesapeake Bay Mouth. Maintenance dredging is required every 2-3 years to allow deep-draft commercial and military vessels continued access to the extensive port facilities located around the bay. Ecological damages are expected to be minimal. The original sediment-water interface, as well as deeper substrate material, has already been removed. Some benthic organisms will be lost during dredging and spoiling operations. Temporary turbidity caused by the dreding activity should have only minor effects in the areas of the channel and disposal site. Dredging operations will be conducted during local fish spawning and shellfish setting seasons. Disposal will take place the Dam Neck disposal area. Alternate disposal sites were considered, buy only Cape Henry, Virginia, was deemed to be feasible. This project will not alter the long-term productivity of the national environment and no opposition to the project has been expressed. (Deckert-Florida)
W74-13226

RESOLVING WATER RESOURCE RIDDLES,
Minnesota Dept. of Natural Resources, St. Paul. Div. of Waters, Soils and Minerals.
For primary bibliographic entry see Field 3F.
W74-13230

AGRICULTURAL DRAINAGE AND THE PUBLIC INTEREST, (PART I),
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 3F.
W74-13232

ECOLOGY OF UPPER CATCHMENT AREA OF RIVER NARMADA CLIMOVEGETATIONAL RELATIONSHIPS: I,
Saurashtra Univ., Rajkot (India). Dept. of Biosciences.
M. S. Murthy.
Jap J Ecol, Vol 21, No 5/6, p 188-192, 1971, Illus.
Identifiers: *Catchments, *Forestation, *India(Narmada River), *Flood control, Watersheds(Basins).

Aiming at flood control and soil erosion via afforestation, for the 1st time in India, a scheme on ecology of the upper catchment area of River Narmada has been taken up under the sponsorship of the Council of Scientific and Industrial Research, Government of India, and is being executed in 4 phases. The present series of papers pertains to Phase-I of the project, phytosociological survey of the forest vegetation from the source of the river at Amarkantak up to Jabalpur. The area covers a linear distance of about 310 km and an approximate area of about 20,407 sq km. Of this total area, the investigations presented here cover an approximate area of about 7310 sq km (From Manot to Jabalpur). The meteorological data available has been computed as per the system of Thornthwaite to arrive at figures of water balance. This has enabled to distinguish 4 eco-climate zones, with varying climatic indices. Growth and distribution of different forest trees have been observed to behave differently in the different eco-climatic zones distinguished and in relation to topography also. A study of correlation of the existing forest vegetation in the different 4 eco-climatic zones is the subject of the current series of papers.--Copyright 1973, Biological Abstracts, Inc.
W74-13368

GIGANTIC PIPE RESCUES A TOWN FROM FLOODING.
For primary bibliographic entry see Field 8A.
W74-13447

USE OF DRAINAGE PATTERNS AND DENSITIES TO EVALUATE LARGE SCALE LAND AREAS FOR RESOURCE MANAGEMENT,
Minnesota Univ., St. Paul. Dept. of Horticultural Science.
J. Kuska, and V. A. Lamarra, Jr.
J Environ Syst, Vol 3, No 2, p 85-100, 1973, Illus.

Descriptors: *Drainage patterns(Geologic), Drainage, Analysis, *Analytical techniques, *Minnesota, Watersheds, *Watershed management, Resources development, *Land management, Drainage density, Soil texture, Vegetation.

Objective large scale land capability evaluation techniques are needed if man is going to be able to properly plan where development should take place in the landscape. A 6800 sq. mile watershed (St. Croix River, Minnesota) was studied using a new technique called 'pattern analysis'. By correlating drainage densities to soil textures and vegetation, interferences can be made as to the innate ecological diversity and management potential of a watershed. This information should assist the resource manager in recognizing the diversified nature of a major watershed along with which areas in it are best suited for such functions as road building, logging, recreation development, and wildlife management.--Copyright 1974, Biological Abstracts, Inc.
W74-13453

PLANT POPULATION AND HUMIDITY RELATIONSHIPS IN GRASSLAND: THE QUESTION OF EVALUATING POPULATION SAMPLES, (IN GERMAN),
For primary bibliographic entry see Field 2I.
W74-13491

ECOLOGICAL SURVEY OF THE VENEZUELAN WESTERN LLANOS: IV. THE WESTERN PART OF APURE STATE, (IN SPANISH),
Universidad de Los Andes, Merida (Venezuela). Facultad de Ciencias.
G. Sarmento, M. Monasterio, and J. Silva.
Acta Cient Venez. Vol 22, No 5, p 170-180, 1971. Illus. English summary.
Identifiers: Apure, Crops, Forests, Savannas, *Venezuela, *Land classification.

The regional units of the western part of the Apure State, in southwestern Venezuela are discussed. Four landscapes and 7 land-systems were delimited within this 10,000 km2 area. Each land-system is analyzed in terms of component landforms, the main features of the corresponding soils, and the principal plant communities. The actual and potential land use, as well as the ecological limiting factors within each system are also considered. The region is mostly covered with humid savannas occurring on silty alluvial or eolian deposits, while dry savannas occur on well drained sandy soils of river banks and dunes. On the seasonally waterlogged lowlands with heavy soils, different swamp communities appear. Forests only occur in the western part of the area where they form a continuous high forest that extends eastwards as narrow galleries along the main rivers. The physical and chemical soil conditions strictly limit the development of commercial crops within the whole savanna region, the agriculture being only possible on the best drained soils of the forested zones, where there is neither excess nor dificit of water throughout the year. (See also W74-13500)--Copyright 1973, Biological Abstracts, Inc.
W74-13499

ECOLOGICAL SURVEY OF THE VENEZUELAN WESTERN LLANOS: III. THE SOUTHERN PART OF THE BARINAS STATE, (IN SPANISH),
Universidad de Los Andes, Merida (Venezuela). Facultad de Ciencias.
M. Monasterio, G. Sarmiento, and J. Silva.
Acta Cient Venez. Vol 22, No 5, p 152-169, 1971. Illus. English summary.
Identifiers: *Barinas, Forestation, Vegetational, *Venezuela, Savannas, *Land classification.

This survey covers 8000 km2 of Barinas State in western Venezuela. This was the most densely forested area in the whole Venezuelan Llanos, with several types of lowland tropical seasonal forests covering 70% of the surface. At present, a dramatic deforestation is steadily in progress, giving rise to secondary grasslands and agricultural fields. The remaining 30% of the surface shows a complex mosaic of humid savannas, dry savannas and seasonal or permanent marshes. Three landscapes and 10 land-systems were recognized within this region on the basis of geomorphological, pedological and vegetational patterns. Each of these units is described in terms of land-forms, soil types, plant communities, landscape genesis and actual and potential land use. A particular emphasis is given to the forest types, discussing their structure, floristic composition and leaf function of canopy species, relating then these features to the main ecological stress in the area: annual water balance. (See also W74-13499)--Copyright 1973, Biological Abstracts, Inc.
W74-13500

4B. Groundwater Management

DEVELOPMENT AND MANAGEMENT OF GROUNDWATER IN RELATION TO PRESERVATION OF DESERT PUPFISH IN ASH MEADOWS, SOUTHERN NEVADA,
Nevada Univ., Reno. Desert Research Inst.
R. L. Bateman, A. L. Mindling, and R. L. Naff.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 271, $3.75 paper copy, $2.25 microfiche. Technical Report Series H-W, Publication No 16, 1974. 39 p, 21 fig, 5 tab, 21 ref, 3 append. OWRT C-3038(3676)(1).

Descriptors: *Computer models, *Groundwater, *Water resources development, *Water law, Carbonate rocks, Springs, Wells, Irrigated land, Fish conservation, Great basin, *Nevada, Arid climates, Model studies, Environmental effects.
Identifiers: *Pupfish, Ash Meadows(Nev).

Aim of this research was development and use of a digital ground-water flow simulation model of the Ash Meadows area of southwestern Nevada to evaluate effects of various ground-water development alternatives. Response of water levels in the region to pumping was critical because of the existence of certain species of rare desert pupfish. These small fish inhabit several springs in the area while one species exists only in a limestone sinkhole named 'Devils Hole'. Two general approaches were taken to evaluate management alternatives. In the first, only existing facilities were considered and the model stressed with various annual pumping volumes. In the second, annual pumping volume was held constant and effects of hypothetical wells in various locations simulated. The study was demonstrated that a ground-water flow simulation model can be successfully utilized to analyze effects of manipulation of a large, complex ground-water flow system. Primary limitation of modeling techniques was their inability to deal with small scale inhomogeneities of the aquifer system; this because either they could not be defined or they were 'ignored' by the coarseness of the model grid.
W74-12752

DISPOSAL OF HEATED WATER THROUGH GROUNDWATER SYSTEMS - VOL. I: TECHNICAL AND ECONOMIC FEASIBILITY,
Kansas Univ., Lawrence. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W74-12753

DISPOSAL OF HEATED WATER THROUGH GROUNDWATER SYSTEMS, VOLUME II, USER'S MANUAL NUMERICAL SIMULATION OF FLUID FLOW AND HEAT TRANSFER IN GROUNDWATER SYSTEMS,
Kansas Univ., Lawrence. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W74-12754

INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION: AN APPLICATION OF A MULTISTATE SEQUENTIAL DECISION MODEL,
Haile Selassie I Univ., Alem Maya (Ethiopia).
For primary bibliographic entry see Field 6B.
W74-12787

ADMINISTRATION OF GROUNDWATER AS BOTH A RENEWABLE AND NONRENEWABLE RESOURCE,
Idaho Bureau of Mines and Geology, Moscow.
D. R. Ralson.
Water Resources Bulletin, Vol 9, No 5, p 908-917, 1973. 4 fig, 6 ref.

Descriptors: *Groundwater resources, *Administration, *Appropriation, Water allocation(Policy), Idaho, Groundwater basins, Water yield, Economic efficiency, Groundwater flow, Legislation, Groundwater mining, Water storage.
Identifiers: Raft River Basin(Idaho).

While groundwater represents both a stock and flow resource, state codes in the western states often focus on the flow aspects alone. The inappropriateness of this policy is examined by scrutinizing the administrative techniques of allocating this water resource in the Raft River Basin, Idaho. Idaho statutes specify that 'full economic development' of the resource be achieved subject to the condition that 'reasonable groundwater pumpage levels' are maintained. Thus groundwater pumpage is restricted to the flow portion of the resource. The Raft Basin, approximately 1510 sq. miles in dimension, has been designated a critical groundwater area. Such a designation restricts future applications to appropriate groundwater while not limiting existing pumpers because existing pumping exceeds the basin's water yield. This designation of the basin fails to accomplish either of the 2 objectives stated in the statute. Full economic development is not achieved because undeveloped land is present in the basin where little or no water level decline has occurred. The second objective of limiting groundwater pumping to the flow portion is also not being achieved. Water is and will continue to be taken from storage in localized areas without decreasing the total groundwater outflow from the basin. (Schroeder-Wisconsin)
W74-12792

FUNDAMENTALS OF TRANSPORT PHENOMENA IN POROUS MEDIA.
International Association for Hydraulic Research, Delft (Netherlands); and International Society of Soil Science, Amsterdam (Netherlands).
For primary bibliographic entry see Field 2F.
W74-12811

MORTALITY FROM CANCER AND CARDIOVASCULAR DISEASES IN THE COUNTY BOROUGHS OF ENGLAND AND WALES CLASSIFIED ACCORDING TO THE SOURCES AND HARDNESS OF THEIR WATER SUPPLIES, 1958-1967,
Stocks (Percy) Colwyn Bay (Wales).
For primary bibliographic entry see Field 5C.
W74-12818

EVALUATION OF CAPILLARY PROPERTIES OF CAPROCKS,
Wyoming Univ., Laramie. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 2F.
W74-12820

SUMMARY OF LATEST WORKS ON UNSTEADY FLOW OF LIQUIDS THROUGH POROUS MEDIA,
Institut Neftekhimicheskoi i Gazovoi Promyshlennosti, Moscow (USSR).
For primary bibliographic entry see Field 2F.
W74-12824

SOME RECENT APPLICATIONS OF THE THEORY OF DISPERSION IN POROUS MEDIA,
Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information.
For primary bibliographic entry see Field 2F.
W74-12854

COSTS OF LAND SUBSIDENCE DUE TO GROUND WATER WITHDRAWAL,
Texas A and M Univ., College Station. Water Resources Inst.
J. P. Warren, L. L. Jones, W. L. Griffin, and R. D. Lacewell.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 289, $4.75 in paper copy, $2.25 in microfiche. Technical Report No 57, July 1974. 79 p, 9 fig, 5 tab, 13 ref, 2 append. OWRT A-023-TEX(1). 14-31-0001-3844, 14-31-0001-4044.

Descriptors: *Land subsidence, *Groundwater, *Withdrawal, Evaluation, *Costs, Projections, *Texas, Water demand, Saline water intrusion, Tidal effects.
Identifiers: *Houston-Baytown area(Tex).

The Houston-Baytown area of Texas is experiencing subsidence of the land surface due to excessive withdrawals of ground water. Significant property damages and losses have resulted from encroachment of tidewater and permanent or temporary flooding. This study estimates the annual average subsidence related costs at $14.6 million for the 1969-73 period. A 300 square mile study area was identified and sampled. Historical costs were estimated at $109.6 million (1943-73). Over $53 million in costs were associated with a six foot tide in 1973. Recurrence of such a tide, given five more ft. of subsidence, could result in costs of over $63 million. Breakeven analysis implied economic justification for withdrawing only that quantity of ground water that would result in no subsidence. Water demand above that rate should be imported in order to minimize total costs to the area. Importation of up to 133 billion gallons a year would be justified to meet demand and avoid subsidence.
W74-12867

CONFERENCE ON RECYCLING TREATED MUNICIPAL WASTEWATER THROUGH FOREST AND CROPLAND.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W74-12869

RENOVATING SECONDARY EFFLUENT BY GROUNDWATER RECHARGE WITH INFILTRATION BASINS,
Agriculture Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W74-12877

PHOSPHORUS AND NITRATE LEVELS IN GROUNDWATER AS RELATED TO IRRIGATION OF JACK PINE WITH SEWAGE EFFLUENT,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
For primary bibliographic entry see Field 5D.
W74-12878

MT. SUNAPEE STATE PARK, NEW HAMPSHIRE SPRAY IRRIGATION PROJECT,
New Hampshire Water Supply and Pollution Control Commission, Concord.
For primary bibliographic entry see Field 5D.
W74-12893

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION WITH RECLAIMED WATER,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5D.
W74-12895

FINITE ELEMENT ANALYSIS OF THREE-DIMENSIONAL GROUNDWATER FLOW PROBLEMS,
University of Wales Inst. of Science and Tech., Cardiff. Dept. of Civil Engineering and Building Technology.
For primary bibliographic entry see Field 2F.
W74-12984

GROWTH AND DECAY OF GROUNDWATER MOUNDS INDUCED BY PERCOLATION,
California Univ., Davis.
For primary bibliographic entry see Field 2F.
W74-12987

ATOLL PERMEABILITY CALCULATED FROM TIDAL DIFFUSION,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2F.
W74-12995

SIMULTANEOUS EVALUATION OF DRAWDOWN DATA FROM SEVERAL OBSERVATION WELLS BY MEANS OF A MODIFICATION OF THE WALTON METHOD,
Technische Hogeschool, Delft (Netherlands). Geophysical Lab.
O. Koefoed.
Journal of Hydrology, Vol 21, No 4, p 315-319, 1974. 3 fig, 2 ref.

Descriptors: *Aquifer testing, *Aquifer characteristics, Transmissivity, Storage coefficient, Drawdown, Wells, Pump testing.
Identifiers: *Semi-confined aquifer, *Leakage factor.

A modification of the Walton method is presented in which drawdown data from several observation wells are fitted simultaneously to the curves of a standard graph. The use of this modified method permits a more balanced evaluation of the drawdown data to be made. Also the length of time over which the drawdown must be measured can be shortened appreciably when the modified evaluation method is applied. (Schicht-ISWS)
W74-12999

CHEMICAL WATER TYPES AND THEIR DISTRIBUTION IN SPACE AND TIME IN THE AMSTERDAM DUNE-WATER CATCHMENT AREA WITH ARTIFICIAL RECHARGE,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
G. B. Engelen, and A. J. Roebert.
Journal of Hydrology, Vol 21, No 4, p 339-556, 1974. 8 fig, 1 tab, 2 ref.

Descriptors: *Groundwater recharge, *Saline water intrusion, *Groundwater movement, *Water types, *Aquifer systems, Hydrology, Geology, Encroachment, Artificial recharge, Geohydrologic units, Exploitation, Hydrogeology, Water management(Applied), Distribution patterns.
Identifiers: Amsterdam(Rhine River).

The geology, hydrology, and types of groundwater exploitation of the Amsterdam dune-water catchment area with artificial recharge of water from the Rhine River are described. A classification of natural and artificial water types in the catchment is presented by means of Stiff diagrams, together with their genesis and distribution in space and time. The natural vertical, hydrochemical zonation in fresh, brackish, and salt groundwaters has been disturbed by decades of overdraft and the use of artificial recharge which was started in 1957. Various mixed water types resulted. Study produced an enlightened concept of water movement in and between the shallow and deep aquifers involved. A detailed case study of a part of the catchment area covers a period of about 50 years. The decisive influence of geological inhomogeneities on the patterns of saltwater encroachment during the period of overdraft and on the patterns of infiltration of river water into the deep aquifer after the start of artificial recharge is demonstrated. The shifts in the subsurface positions of the various water types due to changes in groundwater management of the catchment area are elucidated, and an example of displacement and dispersion phenomena under field operating conditions is given. (Harmeson-ISWS)
W74-13004

AQUIFER ANALYSIS USING BACKWARD DIFFERENCE METHODS,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton.
Journal of Hydrology, Vol 22, No 3-4, p 253-269, 1974. 7 fig, 5 tab, 7 ref.

Descriptors: *Groundwater, *Computers, *Numerical analysis, Mathematics, *Model studies, Simulation analysis, Groundwater movement, Analytical techniques, Comparative costs, Analog computers, Analog models, Aquifers, Unsteady flow.
Identifiers: *Finite difference formulations, *Error analysis, Method comparisons, Over relaxation, Resource management.

Two backward difference methods of solving time dependent aquifer problems, the systematic over-relaxation method and the modified alternating direction method, were critically examined. Both methods were tested for a variety of problems ranging from single well problems with variable mesh spacing to complex multiwell regional groundwater problems. Recommendations were made concerning the choice of method. (Prickett-ISWS)
W74-13012

HYDROGEOLOGY OF THE POTTSVILLE FORMATION IN NORTHEASTERN OHIO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13015

QUALITY OF GROUND WATER IN BIKANER DISTRICT OF WESTERN RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
K. S. Gajbhiye, A. S. Kolarkar, and O. P. Bhatia.
Annals of Arid Zone, Vol 12, No 1 and 2, p 65-70, March and June, 1973. 3 tab, 10 ref.

Descriptors: *Groundwater, *Salinity, *Water quality, *Irrigation, Alkalinity, Water, Sodium chloride, Boron, Calcium, Magnesium.
Identifiers: *India(Rajasthan).

Samples taken in the Bikaner district of western Rajasthan to ascertain groundwater quality were shown to be mostly saline to highly saline in nature, with a substantial amount of sodium chloride. Calcium and magnesium were also found. The content of boron did not present any acute problems. Water quality standards were not met for agricultural use of irrigated waters, but nearly all waters in the area seem to be good for animal consumption, particularly sheep. (Mastic-Arizona)
W74-13151

ARIZONA'S WATER RESOURCES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6D.
W74-13152

UTILIZATION OF DISUSED COAL MINES AS WATER STORAGE RESERVOIRS,
Teesside Polytechnic, Middlesbrough (England). Dept. of Civil Engineering.
T. Cairney.
J Hydrol (Amst). Vol 19, No 3, p 251-258. 1973. Illus.

Descriptors: *Water storage, Underground, *Reservoirs, *Mine water.
Identifiers: Mines.

With the current conflict of land conservation and water resources interests, the potential underground storage in disused coal workings offers a possible solution. Where conditions are suitable, mine workings offer surprisingly large yields at low cost.--Copyright 1974, Biological Abstracts, Inc.
W74-13164

AVAILABILITY OF FRESH GROUND WATER IN NORTHEASTERN WORCESTER COUNTY, MARYLAND: WITH SPECIAL EMPHASIS ON THE OCEAN CITY AREA,
Geological Survey, Parkville, Md.
J. M. Weigle.
Maryland Geological Survey, Baltimore, Report of Investigations No 24, 1974. 64 p, 19 fig, 7 tab, 24 ref.

Descriptors: *Hydrogeology, *Groundwater, *Maryland, Saline water intrusion, Aquifers, Artesian aquifers, Water yield, Transmissivity, Hydrologic data, Data collections.
Identifiers: *Ocean City(Md).

Fresh groundwater in northeastern Worcester County, Maryland, is restricted to sediments about 450 feet thick between the land surface and the top of the St. Marys Formation. The water is available in the Pleistocene aquifer under water-table and semiconfined conditions and in the Pocomoke and Manokin aquifers under confined conditions. The Ocean City-Manokin aquifer system is potentially very productive. Its transmissivity averages about 10,000 square feet per day; potential short-term groundwater yields are estimated to exceed 1,000 gpm and may exceed 12,000 gpm in the northern part of the area. Yields from the Pleistocene and Pocomoke aquifers are estimated to range from 500 to 2,000 gpm each. Withdrawals at Ocean City averaged 3.04 million gallons per day in 1971. More water is withdrawn from the Ocean City-Manokin aquifer system at Ocean City than is available from underflow in that system, yet the water levels showed a net rise, indicating an increase in storage during 1970-72. This suggests that there is considerable recharge to the Ocean City-Manokin system by vertical leakage from the water-table deposits. In 1971, 1.1 billion gallons of water was pumped from the Ocean City-Manokin aquifer system. It is estimated that several times that rate of withdrawal could be sustained if the entire thickness of the aquifer were utilized effectively. However, there is a possibility of saltwater encroachment. The effects of the saltwater on the public supply could be postponed by drilling new wells west of the present well fields. (Knapp-USGS)
W74-13175

AN EVALUATION OF THE MAGOTHY AQUIFER IN THE ANNAPOLIS AREA, MARYLAND,
Geological Survey, Parkville, Md.
F. K. Mack.
Maryland Geological Survey, Baltimore, Report of Investigations No 22, 1974. 75 p, 34 fig, 2 plate, 7 tab, 31 ref, 5 append.

Descriptors: *Hydrogeology, *Groundwater, *Maryland, Surface-groundwater relationships, Safe yield, Water yield, Saline water intrusion, Analog models.
Identifiers: *Annapolis(Md), *Magothy aquifer(Md).

The Magothy aquifer was studied as a source for future water supplies in the Annapolis area in Anne Arundel County, Maryland. The Magothy aquifer is a layer of coarse gray to white sand from 100 to 200 feet thick cropping out in a belt 2 to 5 miles wide on the west side of Chesapeake Bay. The aquifer dips southeastward at approximately 30 feet per mile from an altitude of about 100 feet in upland parts of the outcrop area to about 300 feet below sea level at the southeast end of the Annapolis peninsula. The saline waters of Chesapeake Bay and its estuaries overlie a large part of the area in which the aquifer occurs at depth and also a part of its outcrop area. The Magothy aquifer is a part of a larger hydrologic system including the streams in its outcrop area, overlying and underlying geologic formations, and Chesapeake Bay and its estuaries. Heavy development of the Magothy aquifer will reduce the amount of water available from the streams and adjacent formations and, conversely, further development of adjacent formations will reduce the availability of water from the Magothy aquifer. The aquifer is currently yielding water at a rate of 4 mgd in the Annapolis area. There is presently (1973) little danger of saltwater contamination. Electric-analog model studies indicate that the Magothy aquifer is capable of yielding about 60 mgd in the Annapolis area, if the potentiometric surface is lowered to near its top. About 100 years would be required for water from the estuaries to move through the confining beds to the aquifer under the maximum head differentials that could be developed. (Knapp-USGS)
W74-13176

REGIONAL FLOW SYSTEM AND GROUNDWATER QUALITY IN WESTERN OHIO,
Geological Survey, Columbus, Ohio.
S. E. Norris.
Journal of Research, US Geological Survey, Vol 2, No 5, p 527-531, September-October, 1974. 1 fig, 10 ref.

Descriptors: *Hydrogeology, *Water chemistry, *Ohio, *Groundwater, Water quality, Glacial drift, Till, Aquifers, Carbonate rocks, Groundwater movement, Limestones, Dolomite.

Most deep wells drilled in the carbonate aquifers in western Ohio tap a recognizable regional flow system encompassing all or parts of several major basins. The principal recharge area includes the higher, central part of the region, where much of

the terrain is hummocky glacial moraine. The principal discharge areas are the valleys of the major streams and lowlands along Lake Erie. Groundwater moving through this system undergoes a progressive change in chemical quality, from a calcium bicarbonate type in recharge areas to a calcium sulfate type in discharge areas. Changes in chemical constituents are orderly and predictable. (Knapp-USGS)
W74-13181

WATER RESOURCES OF THE MAUMEE RIVER BASIN, NORTHEASTERN INDIANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13191

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF PARTS OF THE MEDXNEKEAG RIVER AND PRESTILE STREAM BASINS, MAINE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13192

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE LOWER ST. JOHN RIVER VALLEY, MAINE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-13193

EXPERIMENTAL DEVELOPMENT OF POTABLE WATER SUPPLY FOR NEW SOUTH POLE STATION,
Naval Civil Engineering Lab., Port Hueneme, Calif.
J. S. Williams.
Available from NTIS, Springfield, Va 22161 as AD-777 037, Price $3.75 printed copy; $2.25 microfiche. Technical Note N-1328, February 1974. 27 p, 7 fig, 1 tab, 2 append.

Descriptors: *Water wells, *Antarctic, *Ice, *Melting, Snow, Glaciers, Water supply, Water yield, Heat balance.
Identifiers: *Rodriguez wells.

A well was drilled in the ice at South Pole, and the production capability and equipment were evaluated by operating the well during the antarctic summer. The prime objective was to determine the feasibility of installing an operational well for the water supply of a new South Pole Station. The operation of a Rodriguez well consists of circulating water from a pond deep in the snow through a heat exchanger and back into the well. Water is diverted to the station storage system as required. The depth at which a stabilized water pond will be established appears to be 250 feet or slightly below. Based on calculations from heat-exchanger data, a water-pond diameter of 35 feet was maintained with a heat input of approximately 300,000 Btu. With an input of 500,000 Btu the well diameter was approaching 40 feet before the heat was reduced to conserve fuel. (Knapp-USGS)
W74-13197

SUMMARY GROUND-WATER RESOURCES OF BEAVER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
C. W. Poth.
Pennsylvania Geological Survey, Fourth Series, Water Resource Report 39, 1973. 39 p, 4 fig, 1 plate, 7 tab, 22 ref.

Descriptors: *Water resources, *Groundwater, *Pennsylvania, Alluvial channels, Water yield, Hydrogeology, Hydrologic data, Water pollution sources, Coal mine wastes, Water quality, Oil wells.
Identifiers: *Beaver County(Penn).

Groundwater is available in Beaver County, Pennsylvania, from rocks of the Pennsylvanian Monongahela, Conemaugh, Allegheny, and Pottsville Groups and from unconsolidated Quaternary deposits. Groundwater occurs largely in the unconsolidated Quaternary alluvial deposits that are present as terraces and modern flood plains along the major streams of the county. Yields of over 1000 gpm have been reported from wells drilled in these alluvial deposits. Small supplies of water are also available in the bedrock, but the water is generally of poor quality. Most of the water is of acceptable quality. The water is generally high in iron, and much of the bedrock below several hundred feet may contain saltwater. There is no known overdraft of groundwater anywhere in the county. The locations of sources of pollution, such as sanitary landfills and septic tanks, are a major factor in the selection of well sites. The discharge from abandoned strip and deep mines is a major source of pollution. Oil and gas wells that were abandoned and not properly plugged are another source of pollution. (Knapp-USGS)
W74-13200

SUMMARY GROUND-WATER RESOURCES OF WASHINGTON COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
T. G. Newport.
Pennsylvania Geological Survey, Fourth Series, Water Resource Report 38, 1973. 32 p, 5 fig, 6 tab, 12 ref.

Descriptors: Water resources, *Groundwater, *Pennsylvania, Alluvial channels, Water yield, Hydrogeology, Hydrologic data, Water pollution sources, Coal mine wastes, Water quality, Oil wells.
Identifiers: *Washington County(Penn).

Groundwater is available in Washington County, Pennsylvania, from rocks of the Pennsylvanian Monongahela and Conemaugh Groups, the Permian-Pennsylvanian Washington Formation, the Permian Greene Formation, and from unconsolidated Quaternary deposits. The alluvium is generally permeable and, when saturated, will yield moderate to large supplies of water, depending upon the degree of sorting by grain size. Groundwater in a bedrock occurs largeiy in secondary openings, such as joint planes or solution openings. The Greene Formation and the Monongahela Group are poor waterbearers because of the smallness and scarcity of fractures. The Washington Formation crops out extensively in the county, but is also a poor waterbearer. The Conemaugh Group crops out in the extreme northern part of the county and along some stream valleys in other parts of the county. This group is a source of small to moderate supplies of water; the median yield is 5 gpm. Extremes in quality are due to both manmade and natural causes. The most common undesirable constituent of the groundwater is iron. Water drilled in aquifers too far below the level of the major drainage systems shows excessive mineralization. There is no known overdraft of water in Washington County. The greatest water problem in the county is pollution of the water resources by drainage from coal-mining operations. Oil and gas wells that were abandoned but not properly plugged are another source of groundwater pollution. (Knapp-USGS)
W74-13201

SUMMARY GROUND-WATER RESOURCES OF WESTMORELAND COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
T. G. Newport.
Pennsylvania Geological Survey, Fourth Series, Water Resource Report 37, 1973. 49 p, 9 fig, 1 plate, 6 tab, 12 ref.

Descriptors: *Water resources, *Groundwater, *Pennsylvania, Alluvial channels, Water yield, Hydrogeology, Hydrologic data, Water pollution sources, Coal mine wastes, Water quality, Oil wells.
Identifiers: *Westmoreland County(Penn).

Groundwater is available in Westmoreland County, Pennsylvania, from rocks ranging in age from the Mississippian Pocono Group to Quaternary alluvium. The alluvium overlies bedrock in the major stream valleys in the county. The yields of wells drilled from 15 to 85 feet in the alluvium range from 15 to 700 gpm and average 230 gpm. Of the consolidated aquifers, the Pennsylvanian Conemaugh and Allegheny Groups yield small to moderate supplies of water. The Pottsville Group has yields of 20 to 500 gpm, depending on whether the wells penetrate the full thickness of the sandstone. The Mississippian Pocono Group is deeply buried throughout most of the county, but in its outcrop areas there are many hillside springs which yield 5 to 100 gpm. Many samples are high in iron content. In the western part of the county, saltwater is a problem in any well deeper than 50 to 100 feet. The amount of groundwater used for most purposes has probably decreased due to improved plant design and to the use of more efficient manufacturing techniques. Since there is relatively little use of groundwater in the county, there is no known overdraft. The greatest water problem in the county is the contamination of water resources by drainage from coal-mining operations. Other sources of pollution are the numerous oil and gas wells that were abandoned but not properly plugged. (Knapp-USGS)
W74-13202

SUMMARY GROUND-WATER RESOURCES OF BUTLER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
C. W. Poth.
Pennsylvania Geological Survey, Fourth Series, Water Resources Report 36, 1973. 49 p, 4 fig, 1 plate, 7 tab, 27 ref.

Descriptors: *Water resources, *Groundwater, *Pennsylvania, Alluvial channels, Water yield, Hydrogeology, Hydrologic data, Water pollution sources, Coal mine wastes, Water quality, Oil wells.
Identifiers: *Butler County(Penn).

Groundwater is available in Butler County, Pennsylvania from rocks of the Mississippian Pocono Group, the Pennsylvanian Conemaugh, Allegheny, and Pottsville Groups, and from unconsolidated Quaternary deposits. The Quaternary outwash deposits and some of the Quaternary lacustrine deposits are highly permeable and are capable of yielding 100 gpm or more to wells. Rocks of the Conemaugh Group underlie about two-thirds of the county. Reported yields of wells in the Conemauch range from less than 5 gpm to more than 100 gpm; about half of the wells yield 20 gpm or more. The Allegheny Group crops out in the northern half of the county and along the major stream valleys throughout the county. This group is capable of supplying moderate amounts of water to wells. Yields range from less than 5 gpm to more than 100 gpm, and about half the wells yield 50 gpm or more. The Pottsville Group crops out along the major stream valleys in the northern part of the county. Yields of wells in the Pottsville range from less than 5 gpm to more than 300 gpm, and average 36 gpm. The Burgoon Sandstone of the Pocono Group occurs in the northeastern part of the county along the Allegheny River and the lower reaches of Bear Creek. It is an excellent aquifer; reported yeilds range from 9 to 260 gpm and average 82 gpm. High iron content is the main water quality problem in the county. There is no known overdraft of groundwater. The locations of sources of pollution, such as sanitary landfills and septic tanks, are a major factor in the selection of well sites. The discharge from abandoned strip and deep mines is a major source of pollution. Oil and gas wells that were abandoned and not properly plugged are another source of pollution. (Knapp-USGS)
W74-13203

SUMMARY GROUND-WATER RESOURCES OF ALLEGHENY COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
J. T. Gallaher.
Pennsylvania Geological Survey, Fourth Series, Water Resource Report 35, 1973. 71 p, 12 fig, 1 plate, 9 tab, 12 ref.

Descriptors: *Water resources, *Groundwater, *Pennsylvania, Alluvial channels, Water yield, Hydrogeology, Hydrologic data, Water pollution sources, Coal mine wastes, Water quality, Induced infiltration, Oil wells.
Identifiers: *Allegheny County(Penn), *Pittsburgh(Penn).

Groundwater is available in Allegheny County, Pennsylvania from rocks of the Permian-Pennsylvanian Washington Formation, the Pennsylvanian Monongahela, Conemaugh, and Allegheny Groups, and from unconsolidated Quaternary deposits. The Washington Formation and the Monongahela Group are not important as aquifers. The Conemaugh Group crops out extensively north of the Ohio and Allegheny Rivers and contains some of the most important aquifers in the county: the Connellsville, Morgantown, Saltburg, Buffalo and Mahoning sandstones. These formations are generally persistent and waterbearing throughout the county, and have yields ranging from 1 or 2 gpm to 100 gpm. The Allegheny Group is found in the northeastern part of the country. Within this group, the most important aquifers are the Freeport sandstone, which yields 5 to 75 gpm, and the Worthington sandstone, which generally yields enough water for all domestic needs. Water supplies are also available from the Quaternary alluvium, which yields from 5 to 3000 gpm, depending upon the degree of sorting by grain size. Groundwater in the younger geologic formations is usually low in dissolved solids, while water from the deeply buried older formations is hard and sometimes high in chlorides and iron. Despite heavy groundwater pumpage in Allegheny County, there are relatively few instances of overdraft. Use of induced infiltration has allowed high yields and relatively close spacing of wells. Discharge from abandoned strip and deep mines is a major source of pollution. The hundreds of oil and gas wells that were drilled in the county are another source. (Knapp-USGS)
W74-13204

SUMMARY GROUND-WATER RESOURCES OF ARMSTRONG COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
C. W. Poth.
Pennsylvania Geological Survey, Fourth Series, Water Resources Report 34, 1973. 38 p, 6 fig, 1 plate, 7 tab, 27 ref.

Descriptors: *Water resources, *Groundwater, *Pennsylvania, *Alluvial channels, Water yield, Hydrogeology, Fractures(Geologic), Hydrologic data, Water pollution sources, Coal mine wastes, Water quality, Landfills, Septic tanks, Oil wells.
Identifiers: *Armstrong County(Penn).

Groundwater occurs in Armstrong County, Pennsylvania in unconsolidated deposits along the stream valleys, especially the Allegheny River, and in fractures in the bedrock. Yields of wells in the unconsolidated deposits average about 400 gpm and yields as high as 1,100 gpm have been reported. Wells drilled into the bedrock yield considerably less water than those in the unconsolidated material. The average yield of wells in the bedrock is about 25 gpm, although some wells yield less than 1 gpm and some as much as 350 gpm. The water is generally hard and high in calcium, magnesium, sulfate, and iron. Water from deeply buried rocks is also high in chloride. There is no known overdraft of groundwater, but overdraft is possible in the future. The locations of sources of pollution, such as sanitary landfills and septic tanks, are a major factor in the selection of well sites. The chief water problem is contamination by drainage from coal-mining operations. Other sources of contamination are the hundreds of oil and gas wells that were abandoned but not properly plugged. The casings have been removed or are severely corroded, allowing saltwater to rise in the boreholes and contaminate shallow freshwater aquifers. (Knapp-USGS)
W74-13205

INFLUENCE OF RECHARGE BASINS ON THE HYDROLOGY OF NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK,
Geological Survey, Washington, D.C.
G. E. Seaburn, and D. A. Aronson.
Available from GPO, Washington, DC 20402, Price $1.75 (paper copy). Water-Supply Paper 2031, 1974. 66 p, 30 fig, 1 plate, 23 tab, 44 ref.

Descriptors: *Artificial recharge, *Storm runoff, *Urban hydrology, *New York, Urban runoff, Pit recharge, Groundwater recharge, Water management(Applied).
Identifiers: *Long Island(NY).

The hydrology of three recharge basins on Long Island, N.Y., (Westbury, Syosset, and Deer Park basins) was studied. The average percentages of precipitation flowing into each basin were roughly equivalent to the average percentages of impervious areas in the total drainage areas of the basins. Inflow hydrographs for each basin typify the usual urban runoff hydrograph--steeply rising and falling limbs, sharp peaks, and short time bases. Infiltration rates averaged 0.9 fph (feet per hour) at the Westbury recharge basin, 0.8 fph at the Syosset basin, and 0.2 fph at the Deer Park recharge basins. Low infiltration rates at Deer Park resulted mainly from silt, clay, and organic debris washed in from construction sites, and a lack of a well-developed plant-root system on the floor of the basin. The apparent rate of movement of storm water through the unsaturated zone below each basin averaged 5.5 fph at Westbury, 3.7 fph at Syosset, and 3.1 fph at Deer Park. On the average, a 1-inch rainfall resulted in a peak rise of the water table directly below each basin of 0.5 foot; a 2-inch rainfall resulted in a peak rise of about 2 feet. The mound commonly dissipated within 1 to 4 days at Westbury, 7 days to more than 15 days at Syosset, and 1 to 3 days at Deer Park. Average annual groundwater recharge was estimated to be 6.4 acre-feet at the Westbury recharge basin, 10.3 acre-feet at the Syosset recharge basin, and 29.6 acre-feet at the Deer Park recharge basin. Groundwater recharge in the areas where recharge basins are used is probably equivalent to or may slightly exceed recharge under natural conditions (about 148 mgd). (Knapp-USGS)
W74-13206

HYDROGEOLOGIC CHARACTERISTICS OF THE SURFICIAL AQUIFER IN NORTHWEST HILLSBOROUGH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W74-13208

GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
R. S. Stulik.
Arizona Water Commission, Phoenix, Bulletin 8, August 1974. 52 p, 3 fig, 5 tab, 2 ref.

Descriptors: *Water resources, *Groundwater, *Hydrologic data, *Arizona, Data collections, Water yield, Hydrogeology, Irrigation water, Stock water, Basic data collections.
Identifiers: *Hassayampa area(Ariz).

Groundwater conditions in the lower Hassayampa area of Arizona are described. The basic groundwater data are presented. More than 24,000 acres of land is irrigated with groundwater in the 550-square-mile lower Hassayampa area. The principal source of groundwater is the valley-fill deposits, which consist mainly of weakly consolidated sand, silt, and clay; the deposits are as much as 1,200 feet thick in the center of the area. About 95,000 acre-feet of groundwater was pumped from the deposits in 1969. In 1970 the depth to water in the valley-fill deposits ranged from less than 20 to 395 feet below the land surface. From spring 1962 to spring 1970, pumping for irrigation caused water-level declines of as much as 57 feet in the extensively developed part of the area; little or no water-level change took place in the undeveloped part of the area. Specific-capacity values range from 1 to 86 gpm per foot of drawdown. Dissolved-solids concentrations in the groundwater range from 180 mg/liter in the northern part of the area to 3,600 mg/liter near the Gila River. Most of the water contains less than 1,000 mg/liter of dissolved solids. Fluoride concentrations range from 1.2 to 13 mg/liter. Most of the water sampled contains fluoride in excess of twice the recommended optimum value. (Knapp-USGS)
W74-13209

HYDROLOGIC PERSPECTIVE OF SURFICIAL WASTE DISPOSAL,
Geological Survey, Tampa, Fla.
For primary bibliographic entry see Field 5D.
W74-13210

FEASIBILITY STUDY FOR DEVELOPMENT OF HOT-WATER GEOTHERMAL SYSTEMS,
California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
J. B. Combs.
Available from NTIS, Springfield, Va 22161 as AD-771 016, Price $5.25 printed copy; $2.25 microfiche. Final Technical Report 73-2070 for Air Force Office of Scientific Research, March 1973. 115 p, 41 ref, 4 append. AFOSR-72-2393.

Descriptors: *Geothermal studies, *Thermal water, *California, *Energy, Groundwater, Water temperature, *Feasibility studies.
Identifiers: *Geothermal energy.

Naturally occurring hot-water geothermal systems contain a single fluid phase that may be at temperatures far above surface boiling because of the effect of pressure on the boiling point of water. Geothermal reservoirs of the hot-water type are located in the upflowing parts of major meteoric water convection systems. They occur worldwide in the zones of the most recent and most intense geological activity. The development and utilization of hot-water geothermal reservoirs can be for the production of power, fresh water, and heat for space heating. Three potential sites of hot-water geothermal systems, Point Mugu, Twentynine Palms, and China Lake, all located in California, were investigated. The geology and existing data for the Point Mugu Site are not particularly encouraging as far as the potential for a hot-water geothermal reservoir in the area. Because of the high temperature water wells located in the vicinity of the Marine Corps Training Center at the Twentynine Palms Site, and because of the very recent Amboy and Pisgah Craters and their associated extensive lava fields, further research should be initiated in the area. A detailed surface geologic map should be prepared for the China Lake Site. (Knapp-USGS)
W74-13213

INJECTING HIGHLY TREATED SEWAGE INTO A DEEP-SAND AQUIFER,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W74-13310

DESIGN, DRILLING AND COMPLETION, OPERATION, AND COST OF UNDERGROUND

WASTE DISPOSAL WELLS IN GULF COAST REGION OF TEXAS AND LOUISIANA,
Pollution Control and Waste Disposal, Inc., New Orleans, La.
For primary bibliographic entry see Field 5B.
W74-13340

POLLUTION CONTROL: THE RELATION OF WATER QUALITY PROTECTION TO EXPLORATION FOR AND PRODUCTION OF OIL AND GAS IN THE SOUTHWEST,
Texas Water Commission, Austin.
For primary bibliographic entry see Field 5G.
W74-13342

GROUND WATER FOR THE OIL INDUSTRY IN TEXAS AND SOUTHEAST NEW MEXICO,
W. F. Guyton.
In: Oil and Water - A Symposium, Bureau of Economic Geology, Texas University, Austin, January 29, 1965. p 40-47, (1965). 4 fig.

Descriptors: *Irrigation, Oil industry, Alluvium, Sand, Gravel, Limestone, Aquifers, Silt, Clays, Sediments, Caliche, *Groundwater, Saline water, Brackish water, Drilling fluids, Mud, Test wells, Equipment, Well casings, Well screens, *Texas, *New Mexico, Southwest US.
Identifiers: Water-bearing formations, Gulf Coast.

The use of ground water in Texas and Southeast New Mexico is about 12 1/2 million acre-feet per year or about 100 billion barrels per year. The United States uses about 55 million acre-feet per year--thus, the use in Texas is about one-fourth of the total in the United States. Various types of ground water use in Texas and Southeast New Mexico are discussed; irrigation is the most prevalent, comprising 88 percent of the total. Areas of ground water use and major fresh water-bearing formations in this area, and typical well design for the Gulf Coast are described. Where sufficient information does not exist, about such aspects of ground water as positions, thicknesses, character, and extent of the water-bearing beds, their transmissibility and storage coefficients, construction and performance records of existing wells, water levels and artesian pressures, chemical quality and temperature of the water, and the areas and amounts of recharge and discharge, a test well may be drilled. The construction of a large-capacity, gravel-walled well is outlined. (Campbell-NWWA)
W74-13343

ANNUAL REPORT ON GROUND WATER IN ARIZONA, SPRING 1972 TO SPRING 1973,
Geological Survey, Phoenix, Ariz.
H. M. Babcock.
Arizona Water Commission Bulletin 7, April, 1974. 46 p, 31 fig, 1 tab, 19 ref.

Descriptors: *Arizona, *Hydrologic data, *Groundwater resources, *Water levels, Groundwater recharge, Irrigated land, Irrigation water, Water measurement, Water wells, Crops, Groundwater relationships, Surface water, Water demand.
Identifiers: Economic development.

Not only is the location of cities, Agricultural areas, and industries in Arizona largely determined by the availability of adequate potable water supplies, but the type of industry brought to an area is influenced as well. Almost 2/3 of Arizona's water supply has been drawn from groundwater reservoirs for many years, principally for the irrigation of crops, though now municipal and industrial demands are rapidly and steadily increasing. Groundwater withdrawal has exceeded 4 million acre-feet for 20 consecutive years so that through 1972, a total of almost 144 million acre-feet has been withdrawn. Almost 5 million acre-feet were withdrawn during 1972, and demand - particularly in the Basin and Range lowlands province having more than 90% of the cultivated land and more than 80% of the State's population - again exceeded the recharge supply causing an even further decline in the water table. The 1972 estimated groundwater pumpage in Arizona, by areas of major development together with the accumulated total through 1972, is presented. A record of the change in the groundwater storage reservoirs provides an indication of the permanence of the supply and characteristics of the aquifer. Graphs and maps showing water levels in selected wells are included. (Gloyd-Arizona)
W74-13350

HYGIENIC FEATURES OF PERCOLATION WATER INTAKES (IN RUSSIAN),
Municipal Sanitary-Epidemiological Center, Pyatigorsk (USSR).
A. P. Bukhtoyarov.
Gig Sanit. Vol 37 No 7, p 93-95. 1972. Illus.
Identifiers: Groundwater, *Percolation, *Hygiene.

The artificial enrichment of ground-waters with surface waters constitutes a method suitable for increasing the yield of underground water sources and for improving the quality of the percolating water.--Copyright 1973, Biological Abstracts, Inc.
W74-13400

TRITIUM IN PRECIPITATION AND FRESHWATER SOURCES IN ISRAEL,
Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5B.
W74-13444

GROUND WATER LEVEL CONTROL.
For primary bibliographic entry see Field 7B.
W74-13446

ONE FORM OF DEEP DRAINAGE OF UNDERGROUND WATERS (OB ODNOY FORME GLUBOKOGO STOKA PODZEMNYKH VOD),
G. S. Vartanyan.
Doklady Akademii Nauk SSSR, Vol 214, No 6, p 1414-1416, 1974. 2 fig, 8 ref.

Descriptors: *Model studies, *Mathematical models, *Groundwater, *Aquifers, Hydrologic aspects, Hydrologic systems, Hydrogeology, *Drainage.

The discharge of underground waters into higher recipient horizons is described. The discharge zone in the recipient horizon has a hydrodynamic cupola formed by the discharge component, and the cupola is, in most cases, hydrostatically screened by the water stream of the recipient horizon, i.e., the stream flow along a surface of rotation. The ratio of the height of the discharge cupola to the overall height of the recipient horizon is equal to the ratio of the ascending water yield to the water yield of the recipient horizon proper. The ascending water yield can also be determined by multiplying the recipient horizon water yield with a proportionality constant whose formula is presented. (Takacs-FIRL)
W74-13451

4C. Effects On Water Of Man'S Non-Water Activities

SURFACE WATER RESOURCES OF THE USSR AND THEIR CHANGE UNDER THE EFFECT OF INDUSTRIAL AND AGRICULTURAL ACTIVITY,
For primary bibliographic entry see Field 4A.
W74-12983

ANALYSIS OF URBAN LAND TREATMENT MEASURES FOR FLOOD PEAK REDUCTION,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-13043

RECLAMATION STUDIES ON BLACK MESA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 5G.
W74-13144

MAN'S IMPACT ON THE COLORADO RIVER IN THE GRAND CANYON,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, A. Howard, and A. Gailenson.
American Scientist, Vol 62, No 4, p 392-401, July/August, 1974. 9 fig, 2 tab, 10 ref.

Descriptors: *Colorado River, *River flow, *Environmental effects, Hoover Dam, Reservoirs, Geomorphology, Fluvial sediments, Dams, Flash floods, Sediments, Regime, Erosion, Discharge(Water), Deposition(Sediments), Recreation.
Identifiers: *Grand Canyon, Glen Canyon Dam, Lake Mead, Lake Powell, U.S. National Park Service.

Research was conducted to discover how and in what manner the Grand Canyon is adjusting to new and increased uses of the Colorado River, and to what extent man's use of the river is affecting these adjustments. Included in the study are pre- and post-dam hydrologic data, information on beach zone characteristics within the Grand Canyon, and evaluation of Glen Canyon Dam effects. Also investigated was man's use of the river as a result of boat trips through the Grand Canyon. Results show that because of the Glen Canyon Dam, the greatly-altered regime of the Colorado River is contributing to erosion of beach areas, and to the increase of sediments deposited in rapids and falls within the Grand Canyon, which may eventually make them unnavigable. Increased use of the river by man seems to be contributing to the erosion problem but the extent of the impact has not been quantified. (Mastic-Arizona)
W74-13149

INFLUENCE OF RECHARGE BASINS ON THE HYDROLOGY OF NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-13206

CHANGES IN SEDIMENT LOADS IN RIVERS OF THE ATLANTIC DRAINAGE OF THE UNITED STATES SINCE 1900,
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 5B.
W74-13215

SEASONAL EFFECTS IN FLOOD SYNTHESIS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
E. F. Brater, S. Sangal, and J. D. Sherrill.
Water Resources Research, Vol 10, No 3, p 441-445, June, 1974. 6 fig, 3 tab, 8 ref.

Descriptors: *Urbanization, *Flood flow, *Watersheds(Basins), *Hydrographs, Hydrograph analysis, Model studies, Precipitation, Snowmelt, Infiltration, Retention, Seasonal, Storm runoff, *Michigan.

The effect of urbanization on flood flows is studied by analyzing inputs and corresponding flood hydrographs from many watersheds, along with corresponding inputs and responses from

watershed models. The inputs consist of precipitation plus snowmelt minus infiltration and retention. Because of the large seasonal variation in infiltration rates, accuracy was improved by treating rainfall frequencies seasonally in predicting flood runoff from precipitation and snowmelt. A procedure was also developed for including snowmelt with winter rains, and the resulting frequency curves of rain plus snowmelt are presented and compared with conventional rainfall frequency curves. It was shown, as example, that a large difference exists between typical winter and summer patterns in southeastern Michigan. (Sandoski-FIRL)
W74-13298

A MATHEMATICAL EXAMINATION OF URBAN RUN-OFF PREDICTION,
Institute of Hydrology, Wallingford (England).
S. G. Newton, and R. B. Painter.
Proceedings of the Institution of Civil Engineers, Vol 57, Part 2, p 143-157, March, 1974. 11 fig, 12 ref.

Descriptors: *Model studies, *Mathematical models, *Runoff, *Storm water, *Urban runoff, *Rational formula, Sewers, Storm drains.

A rigorous mathematical examination of the more frequently used methods of predicting urban runoff is given as a means of assessing their true limitations, and of indicating where improvements should be made. The study was prompted by the problem of prediction of the amount and distribution of storm runoff from impervious areas and subsequent modifications made in the pipe network. It was found that the rational formula for determining the peak runoff from a catchment allows for changes in storage in pipes and for variations with time of the rainfall. It can be generalized to give the discharge as a function of time. The area-time method allows for the variation in width of the catchment and the change in slope with position. (Murphy-FIRL)
W74-13449

RECIPROCAL INFLUENCE OF LARGE RESERVOIRS AND ADJACENT TERRITORIES IN DIFFERENT NATURAL CONDITIONS OF THE USSR,
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 5C.
W74-13466

4D. Watershed Protection

INTERRELATIONSHIPS BETWEEN QUANTITATIVE GEOMORPHIC CHARACTERISTICS OF THE DRAINAGE BASINS IN SUB-HUMID TO HUMID ENVIRONMENT OF RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 4A.
W74-13147

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ECONOMICS OF INDUSTRIAL WASTE WATER SAMPLING,
N-CON Systems Co., Inc., New Rochelle, N.Y.
For primary bibliographic entry see Field 5D.
W74-12780

FIELD INVESTIGATIONS OF HEATED DISCHARGES FROM NUCLEAR POWER PLANTS ON LAKE MICHIGAN: 1972,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W74-12904

ECOLOGY AND ANALYSIS OF TRACE CONTAMINANTS, PROGRESS REPORT JUNE 1972-JANUARY 1973.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-12905

DEVELOPMENT OF AN ENVIRONMENTAL UNIFIED TRANSPORT MODEL FOR TOXIC MATERIALS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-12906

ENVIRONMENTAL MONITORING OF TOXIC MATERIALS IN ECOSYSTEMS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-12907

HYDROLYTIC BEHAVIOR OF TOXIC METALS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-12911

DEVELOPMENT OF HIGH SENSITIVITY X-RAY FLUORESCENCE FOR ANALYSIS OF TRACE TOXIC ELEMENTS,
Oak Ridge National Lab., Tenn.
C. J. Sparks, Jr., L. A. Harris, and O. B. Cavin.
In: Report No. ORNL-NSF-EATC-1, p 247-265, March 1973. 8 fig, 1 tab, 5 ref.

Descriptors: *Trace elements, *Analysis, *Analytical techniques, *X-ray fluorescence, *Toxins, Toxicity, Environment, Research and development, *Pollutant identification.
Identifiers: *Sensitivity, Geometrical arrangement.

Three new and different geometrical arrangements for x-ray fluorescent analyses (XRF) have been explored to determine their relative merits for improving the detectability of trace elements. As improvement in sensitivity increases, a reduction in the number of elements detected occurs so only one element at a time can be detected with maximum sensitivity. The ultimate detectability of trace elements with XRF is shown to depend on the inelastic scatter of the exciting radiation by the matrix. This inelastic scatter decreases with the average atomic number of the matrix favoring the kinds of samples of most interest to the environmentalist. However, the use of solid state detectors becomes less favorable and crystal analyzers more satisfactory for trace element determinations. With a judicious choice of the variables, detection of several elements at levels of a few parts per billion can be achieved without concentration or any prior treatment of the sample. (See also W74-12905) (Houser-ORNL)
W74-12912

ENVIRONMENTAL APPLICATIONS OF CENTRIFUGAL PHOTOMETRIC ANALYSIS,
Oak Ridge National Lab., Tenn.
G. Goldstein, J. L. Bowling, G. Goldberg, and M. T. Kelley.
In: Report No. ORNL-NSF-EATC-1, p 267-285, March 1973. 8 fig, 5 tab, 27 ref.

Descriptors: *Photometry, Analysis, *Analytical techniques, *Spectrophotometry, *Centrifugation, Environment, Evaluation, Kinetics, Computers, Computer programs, Data collections, Data processing, Research and development, Equipment, *Pollutant identification.

Investigations are reported for the use of the GeMSAEC Fast Analyzer for performing analyses of interest in evaluating environmental quality. Several kinds of photometric methods are adaptable to the GeMSAEC system; emphasis now is on reaction-rate methods, because they are usually simple and sensitive, and on spectrophotometry, because it is by far the most widely used method of analysis. Software development was completed which involved modification of the FOCAL language provided for the PDP-8 computer to allow data collection and data processing with a minimum hardware configuration. Procedures are being developed for the analysis of iodide, selenium, and copper by kinetic methods which it is anticipated will be faster, cheaper, and require fewer separations than conventional methods. A comparison of the GeMSAEC system with other spectrophotometers indicates that it is more precise than most general-purpose instruments, and with appropriate modification could achieve a relative error of less than 0.1%. (See also W74-12905) (Houser-ORNL)
W74-12913

SEPARATION, DETECTION, AND IDENTIFICATION OF ORGANICALLY BOUND TOXIC METALS AND OTHER HAZARDOUS MATERIALS,
Oak Ridge National Lab., Tenn.
Y. Talmi, and R. Crosmun.
In: Report No. ORNL-NSF-EATC-1, p 287-307, March 1973. 7 fig, 6 tab, 10 ref.

Descriptors: Analysis, *Metals, *Toxins, *Toxicity, *Analytical techniques, Research and development, *Gas chromatography, *Mercury, Halides, Chlorides, Water, Springs, Evaluation, *Pollutant identification.

Design and construction are reported of an analytical system utilizing gas chromatography and plasma (microwave) emission spectrometric detection. The system has been optimized and its utilization to develop analytical procedures for organomercurials has begun. Methyl-, ethyl-, and methoxy-ethyl mercury halides have been separated on the GC column and detected at the picogram level. The determination of methylmercury chloride in water, spring water, and freeze-dried fish has been studied, and analytical procedures have been established. Recovery of the methylmercuric chloride from these samples was at the 96-103% range, thus ensuring the accuracy of the analysis. The adequate accuracy was also demonstrated by the good agreement between these results and those obtained by 'total mercury' techniques such as atomic absorption and NAA. Reproducibility, defined as relative standard deviation, is at the 1-6% range. The technique is substantially faster and simpler than most others presently available. (See also W74-12905) (Houser-ORNL)
W74-12914

MEASUREMENT OF MOLECULAR ORGANIC CONTAMINANTS IN POLLUTED WATER,
Oak Ridge National Lab., Tenn.
W. W. Pitt, Jr., and C. D. Scott.
In: Report No. ORNL-NSF-EATC-1, p 309-331, March 1973. 3 fig, 4 tab, 25 ref.

Descriptors: Analysis, *Chromatography, *Analytical techniques, Research and development, *Anion exchange, *Organic matter, Water pollution, Absorption, Effluents, Sewage, *Pollutant identification.

High-resolution, anion-exchange chromatography is being applied to the problem of identifying and quantifying individual trace organic compounds present in various natural waters. The chromato-

graphic system which is being used is capable of analyzing for over 150 ultraviolet absorbing compounds and/or compounds oxidizable with sulfatoceric acid. Six sampling sites have been chosen, and samples from three have been collected, concentrated, and analyzed. Chromatograms of the concentrated samples have contained 20 to 30 significant peaks plus numerous smaller ones indicating a need for a more efficient concentration procedure and/or higher concentration factor. These results are being compared with those obtained from the high resolution analysis of the organic pollutants in the water effluents of sanitary sewage plants. (See also W74-12905) (Houser-ORNL)
W74-12915

RAPID N-15 ISOTOPIC-RATIO ANALYTICAL SYSTEM FOR ENVIRONMENTAL SAMPLES,
Oak Ridge National Lab., Tenn.
R. A. Strehlow, R. Dahlman, and R. D. Ackley.
In: Report No. ORNL-NSF-EATC-1, p 333-347, March 1973. 3 fig, 1 tab, 5 ref.

Descriptors: *Sampling, Environment, Analysis, *Analytical techniques, *Nitrogen, *Stable isotopes, Behavior, *Measurement, Hydrogen, Nickel, Gases, Ammonia, Nitrogen compounds, Research and development, *Pollutant identification.
Identifiers: *Pyrolysis.

A rapid analytical system for measuring nitrogen and its isotopes is discussed. Such a system is needed in order to expand the use of the stable isotopes in studies of the behavior of nitrogen in the environment. Based upon a consideration of sample requirements in terms of size, sensitivity, and accuracy, a system has been planned and partially constructed which is expected to provide measures of both total nitrogen and the 15N:14N ratio. The concept involves pyrolysis of samples in the presence of hydrogen and a nickel catalyst. During this reductive pyrolysis, the nitrogen in the samples produces ammonia mixed with other reduced species. Design of a gas-handling system to concentrate the product gases and to convert the ammonia to molecular nitrogen is described. A mass spectrometer will be used to analyze for total nitrogen and nitrogen isotope ratio. (See also W74-12905) (Houser-ORNL)
W74-12916

TOXIC MATERIALS INFORMATION CENTER ENVIRONMENTAL INFORMATION SYSTEMS OFFICE,
Oak Ridge National Lab., Tenn.
E. D. Copenhaver, and G. U. Ulrikson.
In: Report No. ORNL-NSF-EATC-1, p 409-423, March 1973. 6 tab, 10 ref.

Descriptors: *Metals, *Toxins, *Toxicity, *Documentation, *Data storage and retrieval, *Information retrieval, *Abstracts, *Information exchange, Data collections, Data processing, Indexing, Publications, Technical writing, Translations, Classification, Reviews, Ecology.

The Toxic Materials Information Center (TMIC) was established as a project support center for the Ecology and Analysis of Trace Contaminants Program (EATC). Its purpose is to systematize the information activities of fourteen EATC task groups with regard to acquisition, storage, retrieval, and dissemination of data. TMIC also serves as an informal link between EATC task groups and external groups with similar interests. Pertinent information on toxic materials in the environment, with particular emphasis on metals and organo-metallic compounds, is cataloged, stored, and disseminated through the facilities and services of TMIC's parent organization, the Environmental Information Systems Office (EISO). (See also W74-12905) (Houser-ORNL)
W74-12920

DETERMINATION OF ORGANIC ACIDS OF LOW RELATIVE MOLECULAR MASS (C-1 TO C-4) IN DILUTE AQUEOUS SOLUTION,
Swedish Forest Products Research Lab., Stockholm.
P. O. Bethge, and K. Lindstroem.
The Analyst, Vol 99, No 1175, p 137-142, Feb 1974. 2 fig, 2 tab, 11 ref.

Descriptors: *Water analysis, *Analytical techniques, *Organic acids, *Pollutant identification, *Acidic water, Acids, Organic compounds, Gas chromatography, Chromatography, Water chemistry, Waste water(Pollution), Pulp wastes, Industrial wastes.
Identifiers: Esters.

An analytical procedure is described for determining trace concentrations of short-chain fatty acids and hydroxy acids in water and waste waters. Acids such as acetic, formic, propionic, butyric, glycolic, and lactic acids in concentrations as low as 0.00005 M can be detected by converting them to their tetra-n-butylammonium salts, concentrating to a syrupy consistency, dissolving in acetone, and reacting with benzyl bromide; the resulting benzyl esters are then separated and determined by gas-liquid chromatography. (Buchanan-IPC)
W74-12929

AN IMPROVED METHOD FOR DETERMINATION OF TRACE QUANTITIES OF PHENOLS IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
B. K. Afghan, P. E. Belliveau, R. H. Larose, and J. F. Ryan.
Analytica Chimica Acta, Vol 71, No 2, p 355-366, August, 1974. 3 fig, 6 tab, 17 ref.

Descriptors: *Phenols, *Water analysis, *Pollutant identification, *Analytical techniques, Separation techniques, Fluorometry, Analysis, Storage, Protection, Biodegradation, Bacteria, Waste water(Pollution), Spectrophotometry, *Solvent extractions.
Identifiers: Cresols, Ultraviolet spectrophotometry.

A solvent extraction procedure for the separation and concentration of low levels of phenols is described. Phenols are extracted with n-butyl acetate of isoamyl acetate from natural waters and then back-extracted with NaOH solution. The final extract can be analyzed by the 4-aminoantipyrine, UV spectrophotometric and/or fluorometric methods. These methods have been evaluated in terms of sensitivity, selectivity, precision, accuracy, and ability to determine different phenolic compounds. The solvent extraction/fluorometric method was found to be the most sensitive and accurate for the determination of phenol and cresols; the detection limit is 0.1 microgram/liter for individual phenols. Samples are preserved by the addition of HCl and storage in glass bottles. The acid effectively kills bacteria which biodegrade phenols. (Witt-IPC)
W74-12930

THE BIOLOGICAL MEASUREMENT OF WATER QUALITY,
Institute of Paper Chemistry, Appleton, Wis. Div. of Industrial and Environmental Systems.
E. Zanella.
American Paper Industry, Vol 56, No 5, p 20-23, May 1974. 3 fig.

Descriptors: *Water pollution sources, *Monitoring, *Bioassay, *Water quality, Waste water(Pollution, *Pulp wastes, Water pollution, *Water pollution treatment, Water pollution effects, *Bioindicators, Aquatic life, Aquatic organisms, Effluents, Industrial wastes, Pulp and paper industry, Measurement, Standards, Insects, Discharge(Water), Pollution abatement, Surveys.

The monitoring of biological water quality is discussed, and the importance of high-quality water to the pulp and paper industry is emphasized. A useful tool in maintaining water quality standards is a biological audit that utilizes the structure and composition of various living aquatic communities for measuring changes in water quality. As an example, an unaltered stream was shown to contain immature May flies, caddis flies, and stone flies, whereas under severe waste loading conditions the same stream supported only hardy worms, midge larvae, and leeches. Such biological studies can be used also to detect and monitor the effectiveness of antipollution treatments. Such biological surveys of streams polluted by pulp and paper mill discharges generally follow a certain format. This is described in some detail, including modifications needed under special conditions. (Wise-IPC)
W74-12932

THE CHARACTERIZATION OF SPENT ALKALI/OXYGEN BLEACHING LIQUOR,
State University of New York, Syracuse. Coll. of Environmental Science and Forestry.
E. Scholander, W. B. Durst, G. Pearce, and C. W. Dence.
Tappi, Vol 57, No 3, p 142-145, March 1974. 1 fig, 5 tab, 27 ref.

Descriptors: *Pollutant identification, *Water pollution sources, *Bleaching wastes, *Pulp wastes, Chromatography, Carbohydrates, Phenols, Oxygen, Lignins, Oxygenation, Organic compounds, Alcohols, Organic acids, Pollutants, *Waste identification, Industrial wastes.
Identifiers: Oxygen bleaching, Kraft pulp, Vanillin, Aldehydes, Ketones, Acetone.

Gas and thin-layer chromatographic analysis was used to characterize the solids in a sample of spent liquor from the bleaching of kraft pulp with oxygen and alkali. Methyl alcohol was the principal neutral constituent. Acetone and acetaldehyde were present in much smaller amounts. Phenolic compounds detected included vanillin and vanillic acid in nearly equal concentrations, and a small though significant amount of acetoguaiacone. Acetic and formic acids in 1:4 ratio were present in significant quantities. Carbon dioxide (as sodium carbonate) amounted to 1% of the oven-dry weight of the pulp, and was the most abundant constituent of the spent liquor. The nonvolatile acid fraction (oxalic, malonic, maleic, fumaric, malic, succinic, and citraconic acids, among others) appears to stem largely from lignin degradation products. The acid hydrolyzate of liquor solids showed the presence of D-galactose, D-glucose, and D-mannose. Acidic degradation products of carbohydrates included D-gluconic, D-mannonic, D-xylonic, L-arabinic, D-erythronic, glucoisosaccharinic, metasaccharinic, lactic, glyceric, glycolic, and dihydroxybutyric acids. The neutral plus acid sugar fragments accounted for ca. 9% of the total organic solids in the liquor. (Witt-IPC)
W74-12943

A REVIEW OF THE BIOCHEMICAL OXYGEN DEMAND (BOD-5) TEST,
Beak Consultants Ltd., Toronto (Ontario).
P. J. Leblanc.
Pulp and Paper Magazine of Canada, Vol 75, No 3, p 79-84, Technical Paper T85, March 1974. 9 fig, 19 ref.

Descriptors: *Biochemical oxygen demand, *Organic loading, *Waste water(Pollution), *Water analysis, *Analytical techniques, Industrial wastes, Liquid wastes, Water pollution effects, Pulp wastes, Water pollution sources, Biodegradation, Microorganisms, Effluents, Oxidation, Standards, *Pollutant identification.

The five-day conventional BOD test for evaluation of pollution loads in waste waters is reviewed, in-

cluding its historical background, significance, kinetics, precision, reliability, microbiological aspects, influential variables, accelerated determination methods, and sample preparation techniques. (Buchanan-IPC)
W74-12947

EVALUATION OF A METHOD PRESENTLY USED FOR DETERMINING SUSPENDED SOLIDS IN EFFLUENTS FROM PRODUCTION OF FIBER BUILDING BOARDS (OCENA STOSOWANEJ OBECNIE METODY OZNACZANIA ZAWIESINY W SZIEKACH OTRZYMYWANYCH PRZY PRODUKCJI PLYT PILSNIOWYCH),
Akademia Rolniczej, Warsaw (Poland). Instytut Technologii Drzewnicktwa.
W. Onisko, and A. Cymbarewicz.
Przeglad Papierniczy, Vol 30, No 2, p 51-55, Feb 1974. 5 tab, 12 ref. (English summary).

Descriptors: Water analysis, *Suspended solids, Waste water(Pollution), *Monitoring, *Analytical techniques, *Pulp wastes, *Filtration, *Gravimetric analysis, Filters, Europe, Pulp and paper industry, Effluents, Colloids, *Pollutant identification, Electrolytes, Temperatures, Hydrogen ion concentration, Industrial wastes.
Identifiers: Poland, Building boards, Insulation boards, Paperboards, Hardboards.

Suspended solids in waste waters from fiber building board factories in Poland are presently determined by passing a sample through filter paper and drying and weighing the filter cake. Although the method is simple, its time requirements vary widely, and the reproducibility of results is poor. These disadvantages were traced largely to the presence of colloids which are retained on the filter along with suspended solids. Other factors contributing to the wide scatter of results are accidental impurities and large particles originating from woody raw material, the variable porosity of the filter paper used, and the varied characteristics of effluents, such as pH, temperature, and electrolyte content. Discontinuation of this method and development of better procedures are recommended. (Stapinski-IPC)
W74-12948

AN ION-EXCHANGER/EPOXY RESIN PELLETIZATION METHOD FOR SAMPLE PREPARATION IN X-RAY FLUORESCENCE ANALYSIS. MICROANALYSIS OF METAL IONS IN INDUSTRIAL WASTE WATER,
Murata Manufacturing Co. Ltd., Nagoka (Japan).
M. Murata, and M. Noguchi.
Analytica Chimica Acta, Vol 71, No 2, p 295-302, August, 1974. 4 fig, 6 tab, 4 ref.

Descriptors: *Water analysis, *X-ray fluorescence, *Metals, *Waste water(Pollution), *Pollutant identification, Manganese, Iron, Nickel, Copper, Zinc, Strontium, Lead, Chemical analysis, Epoxy resins, Binders, Ion exchange, Industrial wastes, Analytical techniques, Fluorescence, X-ray analysis, Non-destructive tests, Heavy metals, Cations.
Identifiers: *Sample preparation, Barium, Bismuth, Trace analysis.

A pelletization procedure with epoxy resin as a binder for ion-exchange resin has been developed for sample preparation in x-ray fluorescence analysis. This new technique is applied to microanalysis of Mn, Fe, Ni, Cu, Zn, Sr, Ba, Pb, and Bi in industrial waste waters. The pellets prepared by the proposed procedure are stable and permit high sensitivity and good reproducibility to be achieved. Detection limits of Mn, Fe, Ni, Cu, Zn, Sr, Ba, Pb, and Bi based on a 500 ml sample solution are 0.015, 0.012, 0.005, 0.008, 0.004, 0.009, 0.29, 0.017, and 0.020 ppm, respectively. (Witt-IPC)
W74-12953

GAS-CHROMATOGRAPHIC DETERMINATION OF HYDROGEN SULFIDE IN AQUEOUS SOLUTIONS (GAZO-KHROMATOGRAFICHESKOE OPREDELENIE SEROVODORODA V VODNYKH RAZTVORAKH),
Leningrad State Univ. (USSR); and Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR).
I. L. Butaeva, V. V. Tsibulskii, A. G. Vitenberg, and M. D. Inshakov.
Zhurnal Analiticheskoi Khimii, Vol 28, No 2, p 337-340, Feb 1973. 2 fig, 1 tab, 11 ref. (English summary).

Descriptors: *Water analysis, *Sulfides, *Hydrogen sulfide, *Sulfur compounds, *Analytical techniques, *Pollutant identification, *Industrial wastes, *Chemical wastes, Waste water(Pollution), *Gas chromatography, Chromatography, Thermal conductivity.

A newly developed method is described by which small amounts (down to 1 mg/liter) of hydrogen sulfide can be determined in waters and waste waters with an accuracy of better than 10%, using a gas chromatograph in conjunction with a thermal conductivity detector. (Chern-IPC)
W74-12962

DETERMINATION OF PHENOLS IN EFFLUENTS BY VOLTAMMETRY (OPREDELENIE FENOLOV V STOKAKH VOL'TAMPEROMETRICHESKIM METODOM),
Tsentralnyi Nauchno-Issledovatelski Lesokhimicheski Institut, Khimki (USSR).
Yu. V. Vodzinskii, V. V. Budylina, and I. A. Korshunov.
Gidroliznaya i Lesokhimicheskaya Promyshlennost', No 1, p 7-9, 1974. 1 fig, 3 tab, 7 ref.

Descriptors: *Water analyses, *Analytical techniques, *Phenols, *Polarographic analysis, *Pollutant identification, *Industrial wastes, Waste water(Pollution), *Chemical wastes, Wood wastes, Lignins, Effluents, Foreign research.
Identifiers: USSR, Wood pyrolysis, Silvichemicals.

Phenolic compounds oxidized on a graphic electrode generate a current proportional to their concentration, regardless of the nature, number, or position of substituents in the molecule. A polarographic method based on this finding was developed, using a graphite electrode and a Cd/Cd sulfate reference electrode, and applied to the analysis of effluents from chemical wood-processing factories. Such effluents were found, by gas-liquid chromatography, to contain 30-50% phenol and alkylated phenols, 10-25% of 2,6-dimethoxy-phenol and its para-alkyl derivatives, 15-28% guaiacol and derivatives, and 12-40% pyrocatechol and p-alkylated derivatives. A linear relationship was observed between the limiting current and the concentration of a phenol mixture (resembling wood pyrolyzates), suggesting that a standard solution can be used for determining total phenols in mill effluents. For dilute (below 0.1 mg/liter) and concentrated (over 1 mg/liter) phenol solutions, two separate polarographic procedures were developed, in which differential or integral current-potential curves are recorded, respectively. The method is sensitive down to 0.01 mg of phenol per liter, requires about 30 min for a determination, and is unaffected by the presence of low-molecular carboxylic acids, alcohols, esters, aldehydes, or ketones. Results agreed with colorimetric phenol analyses. (Stapinski-IPC)
W74-12964

PRODUCTION AND RELEASE OF RADIOACTIVE KRYPTON- AND XENON-ISOTOPES BY NUCLEAR POWER PLANTS AND REPROCESSING PLANTS AND THE EXPECTED RADIOLOGICAL BURDEN TILL THE YEAR 2000, (ERZEUGUNG UND FREISETZUNG VON RADIOAKTIVEN KRYPTON- UND XENON-ISOTOPEN DURCH KERNREAKTOREN UND WIEDERAUFARBEITUNG SANLAGEN UND DIE VORAUSSICHTLICHE RADIOLOGISCHE BELASTUNG BIS ZUM JAHR 2000),
Kernfurschungszantrum, Karlsruhe (West Germany).
F. Hilbert.
Dissertation, April 1974. 197 p, 28 fig, 43 tab, 257 ref. English summary.

Descriptors: Radioactivity, Radioisotopes, Krypton, Xenon, Productivity, Nuclear powerplants, Nuclear reactors, Fuels, Effluents, Nuclear explosions, Evaluation, Safety assessment, Degredation, Regulation, Forecasting, Projections, Air pollution, Water pollution.
Identifiers: Fuel reprocessing, Weapons testing, Release rates, Atmospheric concentration, Dose calculation.

The natural production of radioactive Krypton- and Xenon-isotopes is summarized together with the yields from nuclear facilities and nuclear weapons tests. Specific production rates in nuclear power reactors are calculated. The activity flows in the different plants are described and the consequent release rates, representative of time are evaluated. Estimated release rates from 1500 t/a - fuel reprocessing plants are included. With the condition that a dose of 30 mrem/a should not be exceeded for any release, the requisite minimum decontamination factors and cooling times are specified. Based on the forecasted growth of nuclear facilities till the year 2000, the time dependent global concentrations and radiation doses from Kr-85-releases are calculated using different atmospheric models. The effect of noble-gas separation from the plant off-gas streams in nuclear facilities on the exposure is investigated. (Houser-ORNL)
W74-12971

LEAD IN THE CALIFORNIA SEA LION (ZALOPHUS CALIFORNIANUS),
Ohio State Univ., Columbus. Environmental Biology Program.
For primary bibliographic entry see Field 5C.
W74-12973

MIREX: AN UNRECOGNIZED CONTAMINANT OF FISHES FROM LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
K. L. E. Kaiser.
Science, Vol 185, No 4150, p 523-524, August 1974. 2 tab, 15 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Polychlorinated biphenyls, *Lake Ontario, *Fish, Chromatography, Insecticides, Pesticides, *Canada, *Pollutant identification.
Identifiers: Mirex, *Bay of Quinte(Lake Ontario).

A perchlorinated, cage-structured hydrocarbon, $C_{10}Cl_{12}$, also known as mirex or Dechlorane, has been identified in fish samples from the Bay of Quinte, Lake Ontario, Canada. The compound coelutes with polychlorinated biphenyls (PCB's) in residue cleanup procedures and under standard gas chromatographic conditions. Mirex has never been registered for use as an insecticide in Canada, nor does it appear to be in use in any area of the United States discharging water into Lake Ontario or its tributaries. It seems likely, therefore, that this compound may be another widespread environmental contaminant of extremely high geochemical stability and as yet only superficially investigated biological activities. Under standard gas chromatographic conditions its peak is superimposed on that of the polychlorinated biphenyls, and, as a result, the presence of mirex may have been unrecognized and it may have been misinterpreted as a polychlorinated biphenyl isomer. (Harmeson-ISWS)
W74-12990

THE APPLICATION OF STATISTICAL TECHNIQUES TO RIVER QUALITY MANAGEMENT,
EASAMS, Camberley (England).
N. C. Oxley, and B. F. J. Wallis.
Water Pollution Control, Vol 73, No 4, p 449-455, 1974. 3 fig, 20 ref.

Descriptors: *Water quality control, *Management, *Rivers, *Monitoring, *Statistical methods, Hydrologic data, Pollutants, Effluents, Standards, Reach(Streams), Stochastic processes, Ammonia, Decision making, Systems analysis, Equations, Mathematical models.
Identifiers: *Thames River(Great Britain), *Multiple regression analysis, Information.

The applicability of simple statistical techniques to water quality management is discussed. The two main areas in which this form of data analysis may provide quantification for management decision are considered: (1) prediction of future levels of pollutants in rivers for setting suitable standards; and (2) water quality monitoring systems to provide both day-to-day and long-term information for quality management. Statistical modeling recognizes the stochastic nature of those parameters affecting quality levels, while obviating the necessity for long-term research into causal interactive relationships. High ammonia concentrations inhibit the disinfection of water supply and raise costs of chlorination. To determine an optimum effluent standard to keep river concentrations at an acceptable level without incurring excessive treatment costs, it is necessary to predict the fate of ammonia under different conditions within the system. A statistical model, based on multiple regression analysis, has been developed to predict ammonia concentrations in the Thames River. The model uses hydrological and quality information collected by the Thames Conservancy (1967-72) and demonstrates the applicability of statistical modeling to suitable data. Physical modeling provides a basis for economic models which must precede expenditure to clean up polluted river systems if the maximum benefits are to be obtained. (Bell-Cornell)
W74-13024

NONLINEAR LEAST SQUARES TECHNIQUES FOR SYSTEM IDENTIFICATION IN WATER QUALITY,
Columbia Univ., New York. Dept. of Civil Engineering.
J. G. Beliveau, and G. Mattingly.
Journal of Environmental Systems, Vol 4, No 1, p 23-37, Spring 1974. 3 fig, 2 tab, 9 ref.

Descriptors: *Water quality control, *Dissolved oxygen, *Biochemical oxygen demand, *Measurement, *Least squares method, *Model studies, Estimating, Standards, Statistical methods, Simulation analysis, Rivers, Equations, Methodology, Systems analysis.
Identifiers: *Nonlinear programming, *Eigenvalue analysis, *Parametric differentiation.

The method of nonlinear least squares combined with eigenvalue perturbation and parametric differentiation is shown to yield good estimates of water quality parameters in the observation of biochemical oxygen demand (BOD) and the dissolved oxygen (DO) deficit. Most models proposed to represent these experimental observations are variations of the classical Streeter-Phelps equation for the oxygen-sag relationship in rivers. More complicated models of stream water quality would consider the system of partial differential equations resulting from the complete mass, momentum, and energy transport considerations. Various assumptions conveniently reduce these equations to simple relationships. The model presented considers such effects, and respective parameters, as sedimentation, photosynthesis, reaeration rate, runoff, and deoxygenation rate. Both numerically generated test cases and actual laboratory experiments are dealt with in this 'inverse' procedure. Considered are cases with both BOD and DO data and those with DO data only. These methods are applied to a simple model, but they may be used for more complicated models should the data require it; second order terms for decay rates could be considered and the effect of nitrification could be modeled, thus increasing the number of equations. (Bell-Cornell)
W74-13028

STUDIES ON THE CRUSTACEAN PLANKTON OF A FRESHWATER TANK AT PILANI, RAJASTHAN, (IN MALAYALAM)
Christ Coll., Irinjalakuda, (India).
For primary bibliographic entry see Field 5C.
W74-13031

MICROBIAL CO-OXIDATION OF HALOGENATED AROMATIC COMPOUNDS,
Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
For primary bibliographic entry see Field 5B.
W74-13057

HYDROCARBON COMPONENTS TO FLOATING OIL POLLUTANTS OF SEA WATER, (IN JAPANESE),
Shimadzu Seisakusho Ltd., Tokyo (Japan). Tokyo Research Lab.
M. Matsui, K. Watanabe, T. Yoshida, and T. Kawabata.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 40, No 1, p 111-116, January 1974. 6 fig, 1 tab, 6 ref. (English summary).

Descriptors: *Oil, *Pollutant identification, *Oil spills, Pollutants, Water pollution, Sources, Organic compounds, Oil pollution, Oil wastes, Laboratory tests, Analytical techniques, *Gas chromatography, Chemical analysis.
Identifiers: Tar-balls, Crude oil, Hydrocarbon components, Heavy oil.

The components of hydrocarbon pollutants in relation to the source and mechanism of formation of 'tar-balls' were investigated. The hydrocarbon compounds in C-class heavy oil, wasted lubricant and Iranian, Arabian and Minas crude oil samples were analyzed by gas chromatography. Then, each oil sample was floated in a test tank and allowed to settle on the surface of sea water for about four months. The n-paraffine components in each test sample were analyzed periodically. After standing for 400 hours, the hydrocarbon components in the C-class heavy oil, wasted lubricant, Iranian and Arabian crude oil became indistinguishable from one another, while the Minas crude oil was distinctive from other oil samples. The n-paraffine components in tar-balls collected around the Hachijo and Okinawa Islands were analyzed by gas chromatography, and the source and mechanism of formation of such types of solid or semi-solid pollutants were discussed. (Katz)
W74-13075

STUDY OF MEANS OF AUTOMATICALLY CLASSIFYING PLANKTON,
Massachusetts Inst. of Tech., Cambridge.
L. L. Sutro.
Available from the National Technical Information Service, Springfield, Va. 22161 as COM-74-10716; $3.25 in paper copy, $2.25 in microfiche. Massachusetts Institute of Technology Sea Grant Program Report, No MIT-SG 74-11, Index No 74-311-Vlk, January 1974. 25 p, 8 fig, 35 ref.

Descriptors: Technology, *Equipment, *Design, *Plankton, *Classification, Methodology, Systematics, Commercial fishing, Analytical techniques, Gas chromatography, Spectroscopy.
Identifiers: *Sensors, *Automatic recognizer, DNA, Cybernetic design.

Three possible ways of classifying zooplankton chemically are investigated. Classification by DNA is slow and expensive. Mass spectroscopy and gas chromatography of ground, pyrolysed samples, is unreliable. A third method of analyzing the hydrocarbons of stomach, gut and liver has been applied only to large sea animals. Devices to facilitate the work of human sorters are suggested. These include: a stereo-TV-computer that forms a three-dimensional model; gimballed stereo TV cameras that can look around, as human eyes do, with a high resolution central view; solid state sensor arrays to transduce the image; and fast, small and inexpensive computer components. (Katz)
W74-13078

A DIRECT ESTIMATION OF MICROGRAM AMOUNTS OF AMMONIA IN WATER WITHOUT SALT-ERROR,
Tokyo Univ. (Japan). Fisheries Inst.
Y. Nimura.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 39, No 12, p 1315-1324, December 1973. 2 fig, 8 tab, 22 ref.

Descriptors: *Ammonia, *Nitrogen compounds, *Water analysis, *Methodology, *Chemical analysis, Water quality control, Analytical techniques, Colorimetry, Volumetric analysis, Sea water, Salinity, Chemistry, Chlorine, Laboratory tests, Amino acids, Pollutant identification.
Identifiers: *Beer's Law.

A direct colorimetric method has been developed for the determination of ammonia in water without salt-error by using the phenol-hypochlorite reaction. As a large amount of potassium carbonate was added to make the condition of indophenol blue formation nearly constant without regard for the salinity of samples, the method could be made free of salt-error in the determination of samples of either fresh or sea water whose chlorinity was less than 28 parts per thousand. Twenty-five inorganic and thirty-eight organic compounds, including twenty-one L-amino acids, were tested for interference, and little interference was observed in the not strongly polluted samples. (Katz)
W74-13084

SOME HEAVY METALS IN SPRAT (SPRATTUS SPRATTUS) AND HERRING (CLUPEA HARENGUS) FROM THE INNER OSLOFJORD),
Oslo Univ. (Norway). Lab. for Marine Zoology and Marine Chemistry.
For primary bibliographic entry see Field 5C.
W74-13089

THE USEFULNESS OF BIOLOGICAL TESTS FOR DETERMINING THE TOXICITY OF SOME CHEMICAL COMPOUNDS IN WATERS,
Wroclaw Technical Univ. (Poland). Zaklad Biologii Sanitarnej.
For primary bibliographic entry see Field 5C.
W74-13097

METHODS FOR THE DETECTION OF CERTAIN PATHOGENS OF SALMONID FISHES,
Department of the Environment, Winnipeg (Manitoba). Fisheries and Marine Services.
D. C. Gillespie, T. P. T. Evelyn, C. Frantsi, R. M. Mac Kelvie, and N. Neufeld.
Fisheries Research Board of Canada, Miscellaneous Special Publication, No 23, 1974. 10 p, 2 tab, 10 ref.

Descriptors: Methodology, *Salmonids, Fish, Freshwater fish, *Fish diseases, Fish parasites, *Pathogenic bacteria, Laboratory tests, Bacteria, Myxobacteria, Protozoa, Fish hatcheries, Pollutant identification, Water pollution effects.
Identifiers: Autopsy procedures, Disease detection, Fish culture.

Laboratory methods for an integrated step-by-step procedure for handling fish samples to test for major bacterial, viral and myxosporidian pathogens of salmonids are presented. Except for certain situations involving the lethal sampling of wild spawners, the sampling procedures are based on the probability, at the 95% level of confidence, of detecting a disease agent carrier. Composition, transportation and laboratory handling of the samples are described in detail. The methods provide for the detection of pathogens that are divided into two groups, based on degree of ubiquity. Pathogens in the more widespread group are the myxobacteria, motile aeromonads, pseudomonads and the vibrios; identification to the species level is not required for these organisms. Pathogens in the less ubiquitous group are the kidney disease bacterium, redmouth bacterium (Enterobacteriaceae), Haemophilus piscium, Aeromonas salmonicida, the protozoans Myxosoma cerebralis, and Ceratomyxa shasta, and several viruses. (Katz)
W74-13100

STUDIES ON THE INFLUENCE OF PCB ON AQUATIC ORGANISMS-III. RELATIONSHIP BETWEEN THE INTAKE OF PCB AND ITS ACCUMULATION IN VARIOUS TISSUES OF CARP (IN JAPANESE),
Tokai Univ., Shizuoka (Japan). Women's Coll.
For primary bibliographic entry see Field 5C.
W74-13104

CALCULATIONS OF DOSE, POPULATION DOSE AND HEALTH EFFECTS DUE TO BOILING WATER NUCLEAR POWER REACTOR RADIONUCLIDE EMISSIONS IN THE UNITED STATES DURING 1971,
Office of Radiation Programs, Washington, D.C.
J. A. Martin, and C. B. Nelson.
Radiation Data and Reports, Vol 15, No 6, p 309-319, June 1974. 9 fig, 7 tab, 19 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Assay, *Assessment, *Population, Public health, Measurement, Safety, Fuels, Radioactivity, Meteorology, Krypton, Rubidium, Xenon.
Identifiers: *Dose, *Fuel reprocessing.

Atmospheric emissions of radionuclides during 1971 reported by operators of 10 boiling water nuclear power reactors in the United States were analyzed to calculate resulting doses in the general offsite environment. A recently developed computer program (AIREM) was used to perform the calculations. A sector-averaged diffusion equation, using facility generated onsite annual average meteorology, was used to propagate the emission from the release point out to 80 kilometers. In 1971, 3.2 million curies of radioactivity were released to the atmosphere from 10 reactors. The resulting whole body population dose was calculated to be 900 person-rem. The health effects associated with this population dose were calculated to be small fractions of those induced by natural background radiation. Krypton, Rubidium, and Xenon were the major contributors to cloud gamma population doses. (Houser-ORNL)
W74-13110

RADIATION DATA-WATER.
Office of Radiation Programs, Washington, D.C.
Radiation Data and Reports, Vol 15, No 6, p 333-345, June 1974. 5 fig, 7 tab, 8 ref.

Descriptors: *Monitoring, *Sampling, *Analytical techniques, *Assay, *Radioactivity, *Water pollution, Groundwater, Water pollution treatment, Water quality, Surface waters, Water quality standards, Domestic water, New York, Tritium, Strontium, Drinking water.
Identifiers: *Surveillance program, Gross beta.

Data are provided by Federal, state, and foreign governmental agencies and other cooperating organizations. Data reported are accumulated from surveillance programs concerning radionuclide concentrations of surface, ground, and treated water. Most of the analytical determinations are for gross beta and gross alpha radioactivity. These values are compared with the Public Health Service Drinking Water Standards. Radioactivity in New York State Surface Water from January-December 1972 is reported. Separate tables give gross beta, strontium, and tritium concentrations. (Houser-ORNL)
W74-13111

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE QUAD-CITIES STATION, CORDOVA, ILLINOIS, JULY 1968.
EG and G, Inc., Las Vegas, Nev.
Available from NTIS, Springfield, Va 22161 as ARMS-68-6-6. $3.25/copy, $2.25/microfiche. Atomic Energy Commission Report No ARMS-68-6-6, June 1974. 18 p, 3 fig, 3 tab, 3 ref.

Descriptors: *Monitoring, *Nuclear powerplants, Effluents, *Surveys, *Radioactivity, Background radiation, Nuclear wastes, Remote sensing, Data collections, Data processing, Public health, Regulation, *Illinois.

The Aerial Radiological Measuring System (ARMS) was used to survey the area surrounding the Quad-Cities Station during July 1968, prior to reactor start-up. The survey measured terrestrial background gamma radiation with special emphasis given to instrumentation. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 625 square mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background. (Houser-ORNL)
W74-13112

ENVIRONMENTAL MONITORING AT ARGONNE NATIONAL LABORATORY: ANNUAL REPORT FOR 1973,
Argonne National Lab., Ill. Occupational Health and Safety Div.
For primary bibliographic entry see Field 5B.
W74-13114

AN INVESTIGATION OF THE MINERALOGY AND PETROGRAPHY OF URANIUM-BEARING SHALES,
Pennsylvania State Univ., University Park. Dept. of Mineralogy and Petrography.
For primary bibliographic entry see Field 2K.
W74-13116

HOURLY AVERAGE CONCENTRATIONS OF POLLUTANTS DUE TO POINT EMISSIONS NEAR TO THE GROUND - A PROBABILISTIC APPROACH,
Commissariat a l'Energie Atomique, Paris (France).
R. LeQuinio.
Available from NTIS, Springfield, Va 22161 as AECL-4501; $3.25/copy, $2.25/microfiche. Atomic Energy of Canada Limited Report No AECL-4501, March 1973. 8 p, 4 fig, 6 ref. Translated from paper SM-169/14 presented at the International Atomic Energy Agency Symposium on the Principles and Standards of Reactor Safety, Julich, Federal Republic of Germany, 5-9 February 1973.

Descriptors: *Radioactivity, *Nuclear reactors, *Effluents, *Monitoring, *Air pollution, Diffusion, Dispersion, Meteorology, Measurement, Biology, Biodegradation, Environmental gradient, Ecosystems, Food chains, Public health, Absorption, Canada.
Identifiers: Concentration, *Dose measurement, *France.

Several hundred atmospheric diffusion experiments were carried out during the past ten years at different sites in France. For sources close to the ground (0 to 50 m) the values of the maximum concentrations at 2.5 km and 11 km have log-normal distributions with essentially the same standard deviations. The probability that predetermined concentrations will be exceeded is a deduced directly from these laws and not by means of approximately representative calculations. The median values and the distribution vary from one site to another. In particular the number of exceptionally unfavorable situations is also probably very variable depending on time and place. A study of the site ought to provide information on preferential plume trajectories. Two other issues remain almost entirely unresolved as much for the average values as for the dispersion: (1) the effect of the height of the release, and (2) the effect of the duration of the release and of the exposure. (Houser-ORNL)
W74-13124

USE OF GAS CHROMATOGRAPHY IN THE ANALYSIS OF PHENYL-SUBSTITUTED RESIDUES OF UREA DERIVATIVES, (IN RUSSIAN),
D. B. Girenko, and M. A. Klisenko.
Vopr Pitan, Vol 31, No 5, p 89-91. 1972, Illus.
Identifiers: *Gas, Chromatography, Diuron, Herbicides, Kotoran, Linuron, Monolinuron, Monuron, Neburon, Patoran, Phenyl, Potatoes, Residues, Tenoran, *Urea derivitives, *Pollutant identification.

Procedures and optimal conditions are described. The eluting characteristics of diuron, linuron, monuron, gotoran, neburon, monolinuron, Tenoran and Patoran are presented. Diuron was determined in potatoes and linuron, monuron and diuron in water and air.--Copyright 1974, Biological Abstracts, Inc.
W74-13126

DETERMINATION OF CHEMICAL OXYGEN DEMAND INDICES IN WATER, (IN RUSSIAN),
I. M. Kutyrin, and Yu. P. Belichenko.
Gig Sanit. Vol 37, No 9, p 99-100. 1972.
Identifiers: Rivers, Sewage, *Chemical oxygen demand, Biochemical oxygen demand, Pollutant identification.

Values for biochemical and chemical oxygen demand in different portions of Soviet rivers are listed. These indices may be used to analyze the amount of organic substances in treated sewage water.--Copyright 1974, Biological Abstracts, Inc.
W74-13130

DETERMINATION OF TRITIUM IN WASTE PROCESSING EFFLUENTS BY DISTILLATION AND LIQUID SCINTILLATION EMULSION COUNTING,
Atlantic Richfield Hanford Co., Richland, Wash. Manufacturing and Waste Management Div.
R. A. Hamilton.
Available from NTIS, Springfield, Va 22161 as ARH-SA-188, $3.25/copy, $2.25/microfiche. Report No ARH-SA-188, April 1974. 24 p, 2 fig, 4 tab, 8 ref, append.

Descriptors: *Management, *Nuclear wastes, *Waste disposal, *Waste treatment, *Tritium, Analysis, Analytical techniques, Environment, Effluents, Nuclear powerplants, Separation techniques, Waste storage, Public health, *Pollutant identification.

As part of Atlantic Richfield Hanford Company's nuclear waste management program at Hanford, moderate to low levels of tritium must be analyzed in steam and process condensates containing comparable or higher levels of several other fission products to assure that any releases to the environment are minimal and pose no danger to the public.

A modified distillation cleanup procedure has been developed that will completely separate aqueous tritium samples from twelve radioactive isotopes commonly found in aged fission products mixtures. An emulsion type of liquid scintillation cocktail is used to incorporate a relatively large volume of the aqueous sample and maintain a tritium counting efficiency normal in excess of 20%. (Houser-ORNL)
W74-13134

LEPTOSPIRES FROM WATER SOURCES AT DIXON SPRINGS AGRICULTURAL CENTER,
Illinois Univ., Urbana. Coll. of Veterinary Medicine.
D. N. Tripathy, and L. E. Hanson.
J Wildl Dis. Vol 9, No 3, p 209-212. 1973.

Descriptors: *Illinois, Water pollution, Pollutants, Diseases, *Animal diseases, *Pollutant identification.
Identifiers: Gerbils, Hamsters, *Leptospires.

Leptospiral isolations (56) were made from 101 water samples (thought to be a vehicle of transmission of leptospires to animals or vice versa) collected from water sources on a 2020 ha semi-wooded area in southern Illinois. Although 4 isolates reacted with standard antisera against several pathogenic serotypes, none was able to produce signs in either gerbils or hamsters.--Copyright 1974, Biological Abstracts, Inc.
W74-13160

APPLICATION OF RED-LEAD TO THE DETECTION OF DISSOLVED SULFIDE IN WATERLOGGED SOILS,
Universidade Federal da Bahia, Salvador (Brazil). Inst. of Geosciences.
For primary bibliographic entry see Field 2G.
W74-13161

DEVELOPMENT OF A FLOATING OIL SLICK DETECTOR.
URS Research Co., San Mateo, Calif.
A. R. Kriebel.
Available from NTIS, Springfield, Va 22161 as AD-777 023, Price $5.75 printed copy; $2.25 microfiche. Coast Guard Office of Research and Development, Final Report No CG-D-42-74, November 1973. 126 p, 104 fig, 3 tab.

Descriptors: *Oil spills, *Pollutant identification, *Oily water, *Monitoring, *Instrumentation, Equipment, Oil pollution, Viscosity.
Identifiers: *Oil-slick detector.

A floating oil slick detector operates like a viscometer, with a cylinder spinning inside a slightly larger cylindrical shroud partially submerged in the water surface. An oil slick causes the spinner to become coated with oil (rather than water) so that the shaft torque and the electrical current through the drive motor both increase. The increased current can be used to close a relay and thereby signal the presence of floating oil. Test data reported include the recorded variations of motor current for four types of oil, three oil slick thicknesses, and 10 different spinner-shroud configurations. The effects of floating debris particles, debris filters, simulated wave motion, and different spinner materials were also tested. The effects of submerging the detector, cycling it on and off, and cycling it forward and reverse were also studied to determine whether the corresponding transients in the motor current might be used to indicate the various types and thicknesses of oil slicks. Oil slicks are readily detected by most of the spinner-shroud configurations, and there is also a limited capability to discriminate the types and thicknesses of oil slicks. (Knapp-USGS)
W74-13171

REGIONAL FLOW SYSTEM AND GROUNDWATER QUALITY IN WESTERN OHIO,
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 4B.
W74-13181

RECONNAISSANCE STUDY OF SELECTED NUTRIENTS, PESTICIDES, AND TRACE ELEMENTS IN THE EEL, SALINAS, AND SANTA ANA RIVERS, CALIFORNIA, OCTOBER 1971 THROUGH JULY 1972,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W74-13195

A MEMBRANE FILTRATION TECHNIQUE FOR THE ENUMERATION OF ESCHERICHIA COLI IN SEAWATER,
Ministry of Agriculture, Fisheries and Food. Burnham-on-Crouch (England). Fisheries Lab.
S. Halls, and P. A. Ayres.
Journal of Applied Bacteriology, Vol 37, No 1, p 105-109, 1974. 2 tab, 7 ref.

Descriptors: *Bacteria, *E. coli, *Sea water, *Filtration, Sewage, Pollution, Saline water, Fresh water, Laboratory tests, Monitoring, Coastal areas, Membranes, *Pollutant identification.
Identifiers: *Membrane filtration, *Fecal contamination, Enumeration.

Membrane filtration has become an accepted method for enumerating Escherichia coli in water, but little published evidence could be found to judge the specificity of the method to assess faecal contamination in either fresh or saline waters. A laboratory method was used to monitor the extent and degree of sewage pollution in coastal areas. There is still need for information on what proportion of lactose-fermenting colonies from seawater, developing at 44F on a 4 percent enriched Teepol medium, are E. coli type I. A total of 1352 colonies from seawater was tested for production of indole and for gas from lactose at 44F. In addition, 46 percent of the colonies were screened by the IMVEC series of tests. The proportion of colonies tested ranged from 10-100 percent, depending on the number of colonies on the membrane. Many of the colonies (81.9 percent) to which IMVEC tests were applied were E. coli type I; a further 10.9 percent were Irregular type I. (Prague-FIRL)
W74-13237

RAPID METHODS FOR THE DETERMINATION OF FAECAL CONTAMINATION IN OYSTERS,
New South Wales Univ., Kensington (Australia). Dept. of Food Technology.
R. B. Oadri, K. A. Buckle, and R. A. Edwards.
Journal of Applied Bacteriology, Vol 37, No 1, p 7-14, 1974. 6 tab, 15 ref.

Descriptors: *E. coli, *Incubation, *Laboratory tests, *Oysters, Contamination, Analytical techniques, Food, *Pollutant identification.
Identifiers: *Fecal coliforms, *Enteric pathogens, Most Probable Number method, MacConkey broth, Peptone water, Food poisoning.

The fact that food poisoning outbreaks are known to result from the consumption of fecally contaminated oysters makes it desirable that such products should be examined for enteric pathogens. Two methods for the rapid detection and estimation of numbers of fecal coliforms and Escherichia coli type I in oysters have been developed. That for fecal coliforms involves incubation of tubes of MacConkey broth for 2 h at 37F and then for 22-24 hours at 44F. The second method, a modification of MacKenzie, Taylor and Gilbert's (1948) specific method for E. coli type I, makes use of the same system of incubation, but requires the inoculation of tubes of peptone water as well as MacConkey broth, the former tubes being used for subsequent testing for indole formation. Both methods take only 24-26 hours and are as sensitive and accurate as the Most Probable Number methods which are in common use and which take upwards of 72-96 hours to complete. (Prague-FIRL)
W74-13238

SEPARATE DETERMINATION OF RESIDUAL AMOUNTS OF METHYLNITROPHOS IN APPLES AND WATER BY THE COLORIMETRIC METHOD, (IN RUSSIAN),
K. G. Novikova, and L. I. Leshchinskaya.
Gig Sanit. Vol 37, No 11, p 80-82, 1972. Illus.
Identifiers: Apples, Colorimetry, *Methylnitrophos, Pesticides, Residues,.

A method for the determination of the residues of isomers of methylnitrophos (0,0-dimethyl-0-(3-methyl-4-nitrophenyl)thiophosphate) (MNP) in apples and water in presented. The method involves extracting MNP with acetone and a redistribution from the water-acetone medium into chloroform. For sepatate determinations of the isomers additional operations are introduced. The methods of determining MNP in apples based on the sum of isomers and separately of microgram amounts of isomers of MNP in water are described.--Copyright 1973, Biological Abstracts, Inc.
W74-13239

SANITARY-VIROLOGICAL CHARACTERIZATION OF SEWAGE WATERS FROM SOME URBAN SEWAGE SYSTEMS IN THE UZBEK SSR, (IN RUSSIAN),
Uzbeksksii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
L. E. Ergasheva, M. S. Artykov, and I. I. Ilinskii.
Gig Sanit. Vol 37, No 9, p 92-93, 1972.
Identifiers: *Coxsackievirus, *Echovirus, Enteroviruses, Hepatitis, Picornaviruses, *Poliovirus, Sewage, Viruses, *USSR(Uzbek), Wastewater treatment, Isolation, Pollutant identification.

The isolation of cytopathogenic agents, including enteroviruses (coxsackie virus, poliovirus and ECHO virus) from sewage systems in different cities from 1965-70 was analyzed. Treatment of water in humus tanks did not eliminate enteroviruses although biological purification and chlorination somewhat reduced the frequency. Analysis of sewage water was an appropriate method for sanitation control in The Uzbek SSR (USSR) and was recommended as a method for analyzing the distribution of hepatitis associated virus.--Copyright 1974, Biological Abstracts, Inc.
W74-13241

BOD MEASURING APPARATUS,
L. W. Fleischmann.
United States Patent 3,810,738. Issued May 14, 1974. Official Gazette of the United States Patent Office, Vol 922, No 2, p 573, May, 1974. 1 fig.

Descriptors: *Patents, *Biochemical oxygen demand, *Sampling, *Measurement, *Oxygen, Gas, Pressure, Waste water treatment, *Pollutant identification.
Identifiers: Closed loop gas passageway, Oxygen partial pressure sensor, Make-up gas.

The BOD of a waste water sample is measured by continuously recirculating an oxygen-containing gas through a closed loop gas passageway. The equipment is adapted to pass the gas in series through the waste water sample, a carbon dioxide absorber, and an oxygen partial pressure sensor. A make-up gas containing oxygen in a predetermined proportion is admitted to the closed loop passageway in an amount so that the oxygen partial pressure in the circulating gas remains constant. Inert gas in the make-up gas causes pressure in the system to build as additional oxygen is consumed. The BOD in a given sample is there fore in-

dicated by measuring the gas pressure in the closed loop passageway. (Prague-FIRL)
W74-13242

FLUID ANALYZER WITH VARIABLE LIGHT PATH,
Gam Rad, Inc., Detroit, Mich. (assignee)
For primary bibliographic entry see Field 7B.
W74-13252

TEMPERATURE-CONTROLLED FLUID MANIFOLD FOR A FLUID SYSTEM OF AN AUTOMATED SAMPLE ANALYZER,
Technicon Instruments Corp., Tarrytown, N.Y. (assignee)
For primary bibliographic entry see Field 7B.
W74-13258

LASER LIGHT SPOTS WATER POLLUTION.
Canadian Chemical Processing, Vol 58, No 4, p 31-32, April, 1974.

Descriptors: *Instrumentation, *Remote sensing, *Fluorometry, Water quality control, Application methods, Monitoring, Pollutant identification.

A remote sensing laser fluorometer device has been developed by the Inland Waters Directorate of Environment Canada. This insteument is able to detect specific substances at a distance, to operate at night, to perform well in bad weather, to monitor large areas from land, shipboard, or airborne platforms, and to run unattended for long periods. The entire system, including power supply, weighs 100 kilograms with about 600 watts of 120-volt AC required to run it. Considerable sophistication is required to interpret the readout of the instrument. Other than water quality monitoring, the laser fluorometer can be applied in looking for oil pipeline leaks and performing airborne forest health surveys. (Sandoski-FIRL)
W74-13278

BIO-DEGRADATION OF NON-IONIC SURFACTANTS-II: BIODEGRADATION ASSESSMENTS (BIODEGRADAZIONE DI TENSIOATTIVINON IONICI. NOTA 2: MISURE DELLA BIODEGRADAZIONE),
Montecantini Edison, Novara (Italy). Instituto di Richerche G. Donegani.
For primary bibliographic entry see Field 5B.
W74-13279

DETECTION OF DILUTE ORGANIC ACIDS IN WATER BY INELASTIC TUNNELING SPECTROSCOPY,
Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
Y. Skarlatos, R. C. Barker, G. L. Haller, and A. Yelon.
Surface Science, Vol 43, No 2, p 353-368, June, 1974. 9 fig, 2 tab, 14 ref.

Descriptors: *Water chemistry, *Analytical techniques, *Spectroscopy, *Organic acids, Application techniques, *Pollutant identification.
Identifiers: Inelastic electron tunneling spectroscopy.

Oxidized aluminum films were exposed to acetic, formic, and cynoacetic acid and covered with a lead film. These form junctions which carry electrical current by electron tunneling. The technique of inelastic electron tunneling spectroscopy, which reveals the characteristic vibration spectra of the molecules adsorbed on the oxide surface, was used to detect the presence of the organic molecules in the parts per million range. The intensity of the spectral lines, which is dependent upon the competition between water and the organic molecules for the adsorption sites on the alumina surface, appears to saturate in the 10 to 1000 ppm range. From the spectra obtained, one can distinguish between different molecules with similar structure and between different surface bonding configurations. The method should be applicable to the detection of low concentrations of other, similar organic molecules that adsorb readily on the alumina surface. (Sandoski-FIRL)
W74-13304

LEVELS OF MIREX AND SOME OTHER ORGANOCHLORINE RESIDUES IN SEAFOOD FROM ATLANTIC AND GULF COASTAL STATES,
Pacific Northwest Forest and Range Experiment Station, Corvallis, Oreg. Forestry Sciences Lab.
G. P. Markin, J. C. Hawthorne, H. L. Collins, and J. H. Ford.
Pesticides Monitoring Jornal, Vol 7, No 3/4, p 139-144, March, 1974. 1 fig, 2 tab, 9 ref.

Descriptors: *Pesticide residues, Oysters, Crabs, Shrimps, Fish, DDT, Polychlorinated biphenyls, Monitoring, Insecticides, Pollutant identification, Water pollution effects.
Identifiers: *Mirex, Organochlorine residue.

A monitoring program of seafood was established to detect mirex insecticide in 1971. Seventy-seven composite samples of oysters, crabs, shrimps, fish, and fish products were gathered from seven areas within a certain distance from where the mirex was being used. The data showed that only 9 out of the 77 samples showed an occurrence of mirppm range of 0.005-0.024, and that those nine originated around Savannah, Georgia. DDT was detected in 74 samples (0.002-2.475 ppm range). Aroclor 1260 occurred in 46 samples. This PCB residue might have been interpreted as mirex were it not for new cleanup methods. (Leibowitz-FIRL)
W74-13315

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W74-13317

WATER QUALITY CONSIDERATIONS IN PLANNING SMALL WATERSHEDS,
Soil Conservation Service, Jackson, Miss.
For primary bibliographic entry see Field 5G.
W74-13319

ACCUMULATION OF DIETARY POLYCHLORINATED BIPHENYLS (AROCLOR 1254) BY RAINBOW TROUT (SALMO GAIRDNERI),
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5C.
W74-13321

THE WORK AND FACILITIES OF THE BRIXHAM LABORAORY OF IMPERIAL CHEMICAL INDUSTRIES LIMITED,
For primary bibliographic entry see Field 5D.
W74-13324

LIQUID SCINTILLATION COUNTING FOR PLUTONIUM IN ENVIRONMENTAL SAMPLES,
Dow Chemical Co., Golden, Col. Rocky Flats Div.
D. L. Bokowski.
American Industrial Hygiene Association Journal, Vol 35, No 6, p 33-344, June, 1974. 9 tab, 21 ref.

Descriptors: *Environmental control, Chromatography, Soil analysis, Pollutant identification, Path of pollutants.
Identifiers: *Plutonium, Liquid scintillation, Environmental samples.

A liquid scintillation counting technique which is applicable to the conventional analysis of plutonium in environmental and biological samples is discussed. A presentation is made of methods for improving the specificity and sensitivity for plutonium. This method was compared to the anion exchange chromatography-alpha plus height spectrometry technique, and made valid by means of a t-test. Procedures for saple preparation are given for air filters, water and soil. Expendiency in preparation is shown. Overall mean recovery of plutonium from the different types of samples was greater than 95 percent. Detectable activity at the minimum for 100-minute counts is 0.18 pCi. (Leibowitz-FIRL)
W74-13325

MONITORING 2,4-D RESIDUES AT LOXAHATCHEE NATIONAL WILDLIFE REFUGE,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
D. P. Schultz, and E. W. Whitney.
Pesticides Monitoring Journal, Vol 7, No 3/4, p 146-152, March, 1974. 4 tab, 11 ref.

Descriptors: *Herbicides, *Pesticide residues, Water hyacinth, Fish, Sampling, Monitoring, Water quality control, *Florida, *2-4-D, Pollutant identification.
Identifiers: DTA-2-4-D, 2-4-D(DMA-2-4-D), Florida gallinules, Boat-tailed grackle, Loxahatchee National Forest(Fla).

In the Loxahatchee National Wildlife Refuge in Florida, more than 7,000 acres along the Hillsboro perimeter canal were sprayed with 2,4-D(DTA-2,4-D) at a rate of 4.48 kg acid equivalent per hectare to control water hyacinth (Eichornia crassipes) in 1971. Samples of fish, water and mud were collected at the three stations along the canal for water quality monitoring and residue analysis. The first application of 2,4-D, supported by spot treatments of DTA-2,4-D and/or the dimethylamine salt of 2,4-D (DMA-2,4-D) controlled water hyacinth very well. The day after the initial treatment saw the highest residue level of 2,4-D in water (0.037 mg/l). Three to 15 days after treatment saw the highest occurrence of hydrosol (0.005 mg/kg). In 60 samples of fish, 3 showed herbicide residue exceeding 0.010 mg/kg, 16 showed less than 0.010 mg/kg, and the remaining samples appeared to be free of any noticeable residue. Residue levels of 0.30 mg/kg and 0.675 were detected in Florida gallinules a day after spraying. No bad effects were found to occur in the hatching of boat-tailed grackle eggs or fledgling development from herbicide use. (Leibowitz-FIRL)
W74-13326

A MULTIPURPOSE SPECTROFLUORIMETER FOR THE STUDY OF NATURAL AND CONTAMINATED WATER, (IN RUSSIAN),
Akademiya Meditsinskikh Nauk SSSR.
V. E. Sinelnikov, O. N. Timakhov, Yu. S. Inin, S. V. Ikonnikova, and A. A. Gikkel.
Gig Sanit, Vol 38, No 1, p 65-68, 1973, Illus.
Identifiers: *Spectrofluorometers, *Pollutant identification, Instrumentation, Measurement.

A single beam, recording spectrofluorimeter model 'Akva-MF', suitable for operation in the visible and UV (250-800 nm) ranges for the analysis of natural and polluted waters, is described. The instrument can be used for determining, organic and inorganic compounds, and for automatic detection of fluorescent substances in water. Polar luminescence spectra can be studied by means of a special adapter.--Copyright 1973, Biological Abstracts, Inc.
W74-13358

AUTOMATIC DEVICES FOR SAMPLING SEWAGE AND SURFACE WATER, (IN RUSSIAN),
Permskii Politekhnicheskii Institut (USSR).
Ya. I. Vaisman, and V. D. Shatilin.

Gig Sanit, Vol 38, No 1, p 70-72, 1973, Illus.
Identifiers: *Sampling, *Sewage, Surface water, *Pollutant identification.

An automatic, water-wheel type sampler waste water from sewer and canal shafts is described. The water wheel is driven by the water at flow rates exceeding 0.1 m/sec. Another automatic, pump-equipped sampler, also suitable for sampling water from water bodies, precludes contamination of the samples with grease and oil used for the pump by filling flasks placed on a horizontal rotary disk.--Copyright 1973, Biological Abstracts, Inc.
W74-13359

VIRUSES AND WATER: II. GENERAL REVIEW OF THE METHODS AVAILABLE TO DETECT VIRUSES IN WATER, (IN FRENCH),
Nancy-1 Univ. (France). Laboratoire d'Hygiene et de Recherche de la Sante Publique.
J.-M. Foliguet, J. Lavillaureix, and L. Schwartzbrod.
Rev Epidemiol Med Soc Sante Publique, Vol 21, No 3, p 185-259, 1973. English summary.
Identifiers: *Pathogens, *Viruses, Reviews, *Pollutant identification.

Technical aspects, applications and advantages of recommended techniques for the recovery of pathogenic viruses from polluted water are generally reviewed.--Copyright 1974, Biological Abstracts, Inc.
W74-13360

HYGIENIC PROBLEMS OF AUTOMATIC MONITORING OF WATER QUALITY (BASED ON DATA OF THE WHO SEMINAR: KRAKOW: 1971), (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
E. K. Strizhant.
Gig Sanit, Vol 37, No 11, p 89-92, 1972.
Identifiers: *Monitoring, Poland, *Water pollution, *Automation.

The great practical value and urgency of introducing automatic methods of checking water quality. Such monitoring, in combination with measures aimed at protecting bodies of water against pollution, should be widely developed.--Copyright 1974, Biological Abstracts, Inc.
W74-13363

DETERMINATION OF URANIUM IN NATURAL WATERS AFTER ANION-EXCHANGE SEPARATION,
Vienna Univ. (Austria). Analsches Institut.
J. Korkisch, and L. Godl.
Analytica Chimica Acta, Vol 71, No 1, p 113-121, July, 1974. 7 tab, 25 ref.

Descriptors: *Water analysis, *Uranium radioisotopes, Freshwater, Trace elements, Anion exchange, Fluorometry, Spectrophotometry, Analytical techniques, *Separation techniques, *Ion exchange, *Pollutant identification.
Identifiers: Uranium compounds.

A method is described for the determination of U by flurorometry and spectrophotometry in samples of natural non-saline waters. After acidification with HC1, the water sample is filtered and, following the addition of ascorbic acid and potassium thiocyanate, passed through a basic anion-exchange resin (Dowex 1-X8, thiocyanate form) column. Uranium is adsorbed as an anionic thiocyanate comples. After removal of iron and other co-adsorbed elements by washing first with a mixture of tetrahydro-furan, methyl glycol, and 6-molar HC1 (50:40:10), and then with pure aqueous 6-molar HC1, the U is eluted with 1-molar HC1. In the eluate, U is determined fluorometrically or by means of the spectrophotometric arsenazo III method. The procedure was used for the routine determination of U in water samples collected in Austria. (Witt-IPC)
W74-13416

DETERMINATION OF AMMONIA LEVELS IN WATER AND WASTE WATER WITH AN AMMONIA PROBE,
Laboratory of the Government Chemist, London (England). Dept. of Trade and Industry.
W. H. Evans, and B. F. Partridge.
The Analyst, Vol 99, No 1179, p 367-375, June, 1974. 8 tab, 7 ref.

Descriptors: *Ammonium compounds, *Water analysis, *Analytical techniques, *Nitrogen compounds, *Instrumentation, *Pollutant identification, Waste water(Pollution), Ammonia, Freshwater, Lakes, Rivers, Swimming pools, Chlorine, Effluents, Industrial water.

An Electronic Instruments Ltd. model 8002-2 ammonia probe was used in the laboratory to measure the discrete free and saline ammoniacal nitrogen present in a wide range of water samples, including swimming-pool water, river and lake waters, industrial effluents, etc. Determination was possible within a precision of 4% for ammoniacal nitrogen levels greater than 0.4 mg/liter, and within 0.015 mg/liter for levels less than 0.4 mg/liter. Samples can be measured in random order, provided that consecutive readings involve absolute potential differences of not more than +60mv. Free chlorine interferes, owing to the presence of chloramines, but dechlorination is readily achieved with thiosulfate. The calculated lower limit of detection of 0.03 mg/liter of ammoniacal nitrogen and the precision at low levels (less than 0.1 mg/liter), which originates partly from the non-Nernstian response of the probe, suggest that accurate determination in potable water would be difficult. The probe can also be used to determine albuminoid nitrogen by taking the difference between the ammoniacal nitrogen and the total free ammoniacal plus albuminoid nitrogen obtained by distillation. (Witt-IPC)
W74-13421

INDUSTRIAL WASTE EFFLUENT MONITORING,
G. V. Cox.
American Laboratory, Vol 6, No 7, p 36-40, July, 1974. 2 tab, 3 ref.

Descriptors: *Monitoring, *Water pollution control, *Water analysis, *Analytical techniques, *Industrial wastes, *Federal Water Pollution Control Act, Alkalinity, Biochemical oxygen demand, Chemical oxygen demand, Dissolved solids, Suspended solids, Ammonia, Nitrogen compounds, Carbon, Hardness(Water), Trace elements, Metals, Organic compounds, Color, Conductivity, Turbidity, Streptococcus, Coliforms, Aquatic bacteria, Legislation, Regulation, Legal aspects, Phosphates, Sulfur compounds, Oil, Pesticides, Radioactivity, *Pollutant identification.

Legally acceptable methods for waste water analysis under the Federal Water Pollution Control Act, PL 92-500 are listed. Included are general analytical methods for determining alkalinity, BOD, COD, total solids, dissolved solids, suspended solids, volatile solids, ammonia, Kjelkahl N, nitrate, P, acidity, organic carbon, hardness, and nitrate; analytical methods for trace metals (A1, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, K, Se, Ag, Na, Tl, Sn, V, and Zn); analytical methods for nutrients, anions, and organics (organic N, orthophosphate, sulfate, sulfide, sulfite, bromide, chloride, cyanide, fluoride, chlorine, oil and grease, phenols, surfactants, algicides, benzidine, pesticides, and chlorinated organic compounds other than pesticides); methods for estimating physical and biological parameters (color, conductance, turbidity, fecal streptococci, and coliformbacteria); and techniques for determining radiological parameters. Maximum holding times for waste discharges before analysis and preservation techniques for the most common water quality parameters are also given. (Witt-IPC)
W74-13422

SIMULTANEOUS DETERMINATION OF DIVALENT CU(2+), PB(2+), CD(2+) AND ZN(2+) IONS IN FRESH TOWN-WATER BY ANODIC STRIPPING POLAROGRAPHY, (IN JAPANESE),
National Chemical Lab. for Industry, Tokyo (Japan).
Y. Yamazaki.
Journal of the National Chemical Laboratory for Industry (Tokyo Kogyo Shikensho Hokoku), Vol 69, No 5, p 154-161, May 1974. 9 fig, 6 tab, 13 ref. English summary.

Descriptors: *Freshwater, *Municipal water, *Water analysis, *Heavy metals, *Copper, *Lead, *Cadmium, *Zinc, Cations, Analytical techniques, Chemical analysis, Pipes, Pipelines, Electrochemistry, Leaching, Solubility, Pollutant identification.
Identifiers: *Polarography.

A polarographic procedure is described for the simultaneous determination of trace amounts of divalent Cu, Pb, Cd, and Zn in city freshwater which had been retained in pipes for 24 to 72 hr. These ions were electrodeposited on a balanced-head stationary hanging mercury drop electrode at -1.5 v (vs. Hg pool) for 5 min while stirring at 300 rpm in 0.5 M Na acetate and 0.1 M K tartrate supporting medium. Anodic dissolution curves were recorded by changing the potential linearly from -1.5 to aero v at a scan rate of 50 mv/sec. The relationship between the dissolution peak currents and the pre-electrolysis potential was examined, and the effects of foreign cations on Cd and Pb, as well as the effects of surfactant on the polarographic behavior of Cu, Pb, Cd, and Zn were studied. The freshwater samples investigated contained about 0.006-0.017 ppm Cu, 0.003-0.017 ppm Pb, 0.005-0.2 ppb Cd, and 0.006-0.04 ppm Zn. The dissolution of these ions from a pipe of 98.5% Zn metal dipped in distilled water was measured at various water temperatures for different immersion times and vary chlorine concentrations. The amount of Zn dissolved (4.3-14 ppm) in pipe-retained city water and of Pb dissolved (0.7-3.6 ppm) in water retained for 24 hr in polyvinyl chloride pipes exceeded the tolerable concentrations for city water, but these amounts decreased rapidly on repeated retentions in the same pipes. (Brown-IPC)
W74-13423

ANNUAL ENVIRONMENTAL MONITORING REPORT: CALENDAR YEAR 1973,
Mound Lab., Miamisburg, Ohio.
For primary bibliographic entry see Field 5B.
W74-13429

ENVIRONMENTAL AND RADIOLOGICAL MONITORING AT THE NATIONAL REACTOR TESTING STATION DURING FY-1973 (JULY 1972-JUNE 1973),
Idaho Operations Office (AEC), Idaho Falls. Health Services Lab.
O. D. Markham.
Radiation Data and Reports, Vol 15, No 5, p 227-246, May 1974. 8 fig, 11 tab, 9 ref.

Descriptors: *Monitoring, Measurement, *Assay, Air, *Groundwater, Milk, *Soils, *Radioactivity, Environmental effects, Sampling, Background radiation, Data collections, Fallout, Regulation, Standards, Ecology, Radioecology, Lakes, Radioisotopes, Rivers, Potable water, Iodine, *Idaho, *Pollutant identification.
Identifiers: *National Reactor Testing Station(Ida), Mud Lake, Snake River.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

The routine environmental monitoring program at the National Reactor Testing Station, (NRTS), Idaho during FY-1973 is described. In addition to the measurement of direct radiation exposures in the environment, the concentrations of radioactivity in air, groundwater, and milk also are determined. The results of a soil sampling program are discussed. The data from onsite and nearby community sampling locations are compared to background concentrations and the applicable standards established by the U.S. Atomic Energy Commission. In addition, several special ecological monitoring programs have been designed to assess the effect of NRTS operations on the environment. One of the ecological studies quantifies the level of radioactivity in antelope tissues collected on and near the NRTS. An investigation to ascertain the ratio of iodine-129 to stable iodine-127 in the NRTS environs also is described. (Houser-ORNL)
W74-13431

ENVIRONMENTAL LEVELS OF RADIOACTIVITY AT ATOMIC ENERGY COMMISSION INSTALLATIONS.
Division of Operational Safety (AEC), Washington, D.C.
Radiation Data and Reports, Vol 15, No 5, p 281-302, May 1974. 8 fig, 17 tab, 8 ref.

Descriptors: *Monitoring, *Radioactivity, Environment, *Data collections, *Assay, *Assessment, Safety, Evaluation, Operations, Onsite investigations, Effluents, Background radiation, Regulation, Standards, *Pollutant identification.
Identifiers: Surveillance program, Rocky Flats(Colo), Sandia Laboratories(N Mex), Stanford Linear Accelerator Center(Calif).

The U.S. Atomic Energy Commission receives from its contractors annual reports on the environmental levels of radioactivity in the vicinity of major Commission installations. The reports include data from routine monitoring programs where operations are of such a nature that plant environmental surveys are required. Releases of radioactive materials from AEC installations are governed by radiation standards set forth by AEC's Division of Operational Safety in directives published in the 'AEC Manual.' Summaries are presented of the environmental radioactivity data for Rocky Flats, the Sandia Laboratories and the Stanford Linear Accelerator Center. Each of the three locations report concentrations well below the permissible limits of radioactivity. (Houser-ORNL)
W74-13432

TRITIUM IN PRECIPITATION AND FRESH-WATER SOURCES IN ISRAEL,
Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5B.
W74-13444

GALVESTON BAY BENTHIC COMMUNITY STRUCTURE AS AN INDICATOR OF WATER QUALITY,
Texas Univ., Port Aransas. Marine Science Inst.
J. S. Holland, N. J. Maciolek, and C. H. Oppenheimer.
Contrib Mar Sci. 17, p 169-188, 1973. Illus.

Descriptors: *Water quality, *Texas, Estuaries, Pollutants, Water pollution, *Benthos, Analytical techniques, Stress analysis, Water analysis, *Bays, Hydrographic analysis.
Identifiers: *Galveston Bay(Tex).

Various methods of community structure analysis including several species diversity indices, rarefaction curves and a probability of interspecific encounter index were applied to data collected from selected sites in Galveston Bay, Texas. Hydrographic data and sediment analysis were used in interpreting the results of the various methods of investigating community structure. The different methods of analysis used in this study showed very close agreement. Three of the 5 investigation sites in Galveston Bay showed normal estuarine water quality. Two other stations showed evidence of large amounts of stress probably due to water quality. One of the 2 was probably stressed due to natural causes, primarily salinity fluctuations. The other, a channel site near a huge industrial complex, showed intermittent stress possibly due to man-made pollution.--Copyright 1974, Biological Abstracts, Inc.
W74-13464

AN INEXPENSIVE SOLID-STATE AMPLIFIER FOR DETECTING MOVEMENTS AND ELECTRICAL POTENTIALS OF FISH,
National Water Quality Lab., Duluth, Minn.
R. A. Drummond, and W. F. Dawson.
Transactions of the American Fisheries Society, Vol 103, No 2, p 391-392, April 1974. 2 fig, 4 ref.

Descriptors: *Equipment, *Technology, *Methodology, *Monitoring, *Instrumentation, Movement, Design.
Identifiers: *Amplifiers, Heart rate, Opercular frequency.

A device for indirectly monitoring opercular frequency, 'coughs', locomotor activity and heart rate of fish is described. (Katz)
W74-13482

DETERMINATION OF NITRATE NITROGEN IN DRINKING-WATER BY CADMIUM-COPPER REDUCTION, (IN JAPANESE),
Aichi Prefecture Inst. of Public Health, Nagoya (Japan).
B. Tomita, H. Nakashima, and N. Hamamura.
J Hyg Chem. Vol 19, No 2, p 88-93, 1973. Illus. English summary.

Descriptors: *Nitrogen, *Potable water, Nitrates, *Pollutant identification.
Identifiers: *Nitrate nitrogen.

A method of Cd-Cu reduction, which was used for sea water, was applied to the determination of nitrate N2 in drinking water. This is more accurate, sensitive and more simple than ordinary methods. One ml of 0.1 M NaCl solution is added to 50 ml of a sample aliquot containing between 0.15 and 100 microgram of nitrate N2. After rinsing the Cd-Cu column with 2mM EDTA.4Na solution, the test solution is passed through the column (column length 12 cm, flow rate 10-20 ml/min). Nitrate is quantitatively reduced to nitrite and many substances in drinking water do not interfere with the reduction. The initial 15 ml of the effluent is discarded and the next 10 ml of effluent is collected. The nitrite N2 concentration of the effluent is determined by diazotization.--Copyright 1974, Biological Abstracts, Inc.
W74-13498

5B. Sources Of Pollution

DISPOSAL OF HEATED WATER THROUGH GROUNDWATER SYSTEMS - VOL. I: TECHNICAL AND ECONOMIC FEASIBILITY,
Kansas Univ., Lawrence. Water Resources Research Inst.
G. P. Willhite, J. Wagner, F. Simonpietri, and J. Stoker.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 302, $5.75 paper copy, $2.25 microfiche. Completion Report, Contribution No 134, July 1974. 134 p, 42 fig, 15 tab, 63 ref. OWRT B-023-KAN(1). 14-31-0001-3284.

Descriptors: *Groundwater, *Mathematical models, *Porous media, *Heat transfer, Instrumentation, Economics, Flow, *Thermal pollution, Heated water, Waste disposal, *Simulation analysis, *Feasibility studies, Cost comparisons, Mixing.
Identifiers: Scaled models, Thermal discharge.

A process to dispose of heated water through a groundwater system, hydraulically connected to the bottom of a river, was studied to evaluate technical and economic feasibility. Three dimensional mathematical models of fluid flow and heat transfer in porous media were developed to simulate the heat disposal process for a prototype alluvium connected to the Kansas River. In the prototype 90 degree F water was injected into the alluvium at rates of 300 gpm/well. For the conditions studied, over 90% of the injected energy would enter the river through its bottom when a quasi steady state was reached. Mixing of the heated water with the cooler 60 degree F river water was simulated in scaled model experiments. The two streams were completely mixed within a short distance downstream of the interchange region when the hot water rate varied between 3.1% and 6% of the cold water rate. An economic analysis was made to determine the costs of energy disposal at rates of 1.5 x 10 to the 7th power, 1.5 x 10 to the 8th power, and 3.0 x 10 to the 8th power Btu/hr using the ground water disposal process. Costs were compared with those estimated for heat disposal using a mechanical draft wet cooling tower. Disposal through the groundwater system was significantly more expensive than via wet cooling water. (See also W74-12754)
W74-12753

DISPOSAL OF HEATED WATER THROUGH GROUNDWATER SYSTEMS, VOLUME II, USER'S MANUAL NUMERICAL SIMULATION OF FLUID FLOW AND HEAT TRANSFER IN GROUNDWATER SYSTEMS,
Kansas Univ., Lawrence. Water Resources Research Inst.
G. P. Willhite, and J. Wagner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 303, $7.25 paper copy, $2.25 in microfiche. Completion Report, Contribution No 134, July 1974. 202 p, 37 fig, 5 tab, 2 append. OWRT B-023-KAN(1).

Descriptors: *Groundwater, *Mathematical models, Porous media, Heat transfer, Instrumentation, Economics, Flow, *Thermal pollution, Heated water, Waste disposal, *Simulation analysis, *Feasibility studies, Cost comparisons, Mixing, *Computer programs.
Identifiers: Scaled models, Thermal discharge.

A numerical model was developed in an effort to determine some of the conditions under which groundwater systems can be used to introduce heated water into a larger body of water when the temperature of the larger body remains within thermal pollution limits. The model is used to simulate the injection and flow of water and heat through the alluvium and the distribution of the hot water as it enters the river channel. The physical model has been presented in Volume I. The mathematical model is capable of simulating the process for a variety of river and alluvium geometries using different distributions of injection wells and injection rates per well. Simulation is based on the combined numerical solution of the three-dimensional transient heat and fluid flow equations in the alluvium. A computer program has been written in FORTRAN IV for the Honeywell 635 computer. Memory requirements are determined by the dynamic storage allocation system so as not to exceed the core size specified on the control card. (See also W74-12753)
W74-12754

THE WATER RELATIONS OF THE ALGA CYANIDIUM CALDARIUM IN SOIL,
California Univ., Los Angeles. Dept. of Bacteriology.
D. W. Smith, and T. D. Brock.
J Gen Microbiol. Vol 79, No 2, p 219-231, 1973. Illus.

Descriptors: *Cultures, Water, *Algae, Soil algae, Photosynthesis, Growth, Bacteria, Soil bacteria, Viability.
Identifiers: *Cyanidium-caldarium.

The effects of water potential on the photosynthesis, growth and viability of natural populations and laboratory cultures of Cyanidium caldarium were measured. C. caldarium was very sensitive to reduced water potential, with matric reduction being more harmful than osmotic. The distribution of this alga in different soil areas appeared to be related to the sensitivity to water stress, larger populations being found in areas with higher water potential. There are very steep gradients of water potential in the soils where C. caldarium is found. The water potential of the surface crust is much too low to allow growth and C. caldarium is found in a subsurface layer. The reduced light intensity below the soil surface interacts with the increased water potential to define the position of the algal layer.--Copyright 1974, Biological Abstracts, Inc.
W74-12777

ECONOMIC GROWTH AND THE GENERATION OF WATERBORNE WASTES,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
S. Feld, and N. Rorholm.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-10162, $2.75 in paper copy, $2.25 in microfiche. Marine Technical Report No 12, 1973. 19 p, 1 fig, 10 tab, 7 ref.

Descriptors: *Economic impact, *Industrial wastes, *Water pollution sources, Domestic wastes, Legislation, Income, Regulation, Mathematical models, Rhode Island.
Identifiers: Systems analysis, Narragansett Bay(RI), Waste loadings, Waste generation, Waste multipliers.

A method to quantify the interaction between economic activity and water effluent loading are illustrated for the area surrounding Narragansett Bay, Rhode Island encompassing the Providence Standard Metropolitan Statistical Area plus Aquidneck Island. The Rhode Island portion of the study area includes 95.5% of the state's total population, 93.5% of its firms, 96.5% of its employment. The methodology illustrated consists of two steps. First an economic model depicting economic activity within the region for the year 1967 was developed. The data was set within an input-output framework so that each of the 59 identified endogenous sectors' input and output flows can be traced. Next the economic model is linked to two environmental matrices to show how the economic interdependencies are related to waste generation. The first incorporates waste coefficients by columns denoting specific wastes generated. The second incorporates data on environmental resource use with each row corresponding to a specific natural resource. Merging of these matrices is discussed. Effluent data were obtained primarily from permit applications submitted by Rhode Island firms to the Corps of Engineers. Results from the modeling application indicate the waste products generated as a result of inter-industry dependencies are of substantial importance to the regional ecology. (Schroeder-Wisconsin)
W74-12782

THE GROWTH OF SELECTED MYCORRHIZAL FUNGI IN RESPONSE TO INDUCED WATER STRESS,
Colo. State Univ, Dep. for and Wood Sci., Fort Collins, Colo. Colorado State Univ., Fort Collins. Dept. of Forest and Wood Science.
J. Mexal, and C. P. P. Reid.
Can J Bot. Vol 51, No 9, p 1579-1588, 1973, Illus.

Descriptors: *Aquatic fungi, *Cultures, Water pollution, Water pollution sources, Pollutant identification, *Investigations, *Soil moisture, Moisture.
Identifiers: Cenococcum-Graniforme, Ethylene, Glycol, Mycorrhizal, Osmoticum, Suillus-Luteus, Thelephora-Terrestris.

Three ectomycorrhizal fungi, Cenococcum graniforme, Suillus luteus and Thelephora terrestris were grown in artificial nutrient media. Water potential of the media was varied by the use of the osmoticum polyethylene glycol (PEG) 4000 and measured by thermocouple psychrometry. C. graniforme was very tolerant of low water potentials and exhibited maximum growth at a potential of -15 bars. Maximum growth of S. luteus and T. terrestris occured at -5 bars. The water potential of solutions containing PEG 4000 appears to consist of both an osmotic and matric component, making PEG 4000 ideally suited for simulation of soil moisture stress. It was neither metabolized nor readily absorbed by C. graniforme as inorganic salts or sugars might be.--Copyright 1974, Biological Abstracts, Inc.
W74-12789

OBSERVATIONS OF MIXING AND DIFFUSION IN POROUS MEDIA,
Mobile Research and Development Corp., Dallas, Tex.
For primary bibliographic entry see Field 2F.
W74-12812

PHYSICO-CHEMICAL AND MICROBIAL REACTION EFFECTS ON TRANSPORT IN POROUS MEDIA,
Wisconsin Univ., Madison. Dept. of Soils.
W. R. Gardner.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 667-682, 1972. 61 ref.

Descriptors: *Path of pollutants, *Soil water movement, Darcys law, Rheology, Filtration, Unsaturated flow, Biochemistry, Water chemistry, Porous media, Soil chemistry, Clay minerals.

Many physicochemical and biological reactions occur in such porous media as soils in the field. These can profoundly influence the flow of the liquid phase. Some of the more well-known processes are discussed in terms of Darcy's law. Surface tension and contact angle effects can be taken into account through their influence upon the potential energy of the soil water, unless the soil particle surfaces are nonwettable. Semiempirical expressions are available for predicting the permeability of swelling soils for mixed calcium-sodium systems. Soil clogging due to bacterial activity during prolonged submergence is well documented but not well understood. Some evidence exists that the flow in soils used as biological and physicochemical filters may be non-Newtonian. Complete understanding of chemical and biological effects requires consideration of coupled flow of soil water, solutes, and gases. (See also W74-12811) (Knapp-USGS)
W74-12850

SOME RECENT APPLICATIONS OF THE THEORY OF DISPERSION IN POROUS MEDIA,
Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information.
For primary bibliographic entry see Field 2F.
W74-12854

SOLUTE TRANSPORT IN AGGREGATED SOILS: TRACER ZONE SHAPE IN RELATION TO PORE-VELOCITY DISTRIBUTION AND ADSORPTION,
Hawaii Univ., Honolulu.
R. E. Green, P. S. C. Rao, and J. C. Corey.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 732-752, 1972. 4 fig, 3 tab, 16 ref.

Descriptors: *Path of pollutants, *Tracers, *Pesticides, *Soil water movement, Adsorption, Porosity, Velocity, Tritium, Dispersion.

Two tracers, tritiated water and picloram, were displaced in laboratory columns of two aggregated subsoils to evaluate the importance of micropore retention and pore-velocity distribution on the transport of solutes in near-saturated soil. Molokai soil, with a wider range of pore sizes, gave asymmetrical tracer zone shapes for both tritium and picloram, while Cecil soil gave nearly symmetrical effluent concentration zones. The apparent coefficient of molecular diffusion for tritium in Molokai soil was about 10 times greater than that for Cecil soil. Secondary peaks on tracer zones for the Molokai soil were intensified by air entrapment and high flow velocity. Calculations of effective pore volume for tritium breakthrough indicated there was no apparent exclusion of water-filled pores from the flow process in either soil. Pore-size distribution and hydraulic conductivity values for the two soils indicated that asymmetric zone shapes for Molokai were due principally to extremely high velocities in pores greater than 150 micrometers in diameter relative to flow in smaller pores. Picloram breakthrough, relative to tritium, was retarded more than was predicted by equilibrium adsorption measurements. (See also W74-12811) (Knapp-USGS)
W74-12855

COMPARISON OF DISPERSION CHARACTERISTICS IN FISSURED ROCK,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
E. Castillo, R. J. Krizek, and G. M. Karadi.
In: Proc of 2nd International Symposium on Fundamentals of Transport Phenomena in Porous Media, August 7-11, 1972, Guelph Univ, Ontario: International Association for Hydraulic Research and International Society of Soil Science Joint Pub, Vol II, p 778-797, 1972. 12 fig, 2 tab, 6 ref.

Descriptors: *Dispersion, *Groundwater movement, *Joints(Geologic), *Path of pollutants, Turbulent flow, Laminar flow, Hydrogeology, Mathematical models.

Time-dependent hydrodynamic dispersion of a contaminant was studied in a mathematical model of a jointed rock mass that consists of two families of plane parallel joints with equal spacings and joint openings. The contaminant is assumed to possess the same properties as the parent fluid in the rock joints, and the surfaces of the joints are considered to be geochemically stable; the intact rock is treated as impermeable, and it does not contribute to the dispersion process. Equipotential lines which make equal angles with the two sets of joints lead to equiconcentration contours which are straight lines parallel to the equipotential contours. Deviations from this situation become greater as the relative differences between the gradients in each joint set increase. The existence of laminar or turbulent flow does not significantly influence the shapes of the equiconcentration contours, although velocities may differ considerably. Joint orientation exerts a strong influence on both the shapes of the equiconcentration contours and

the overall propagation velocity. Confined aquifers may exhibit overall propagation velocities which are twice those for an unconfined aquifer. (See also W74-12811) (Knapp-USGS)
W74-12857

APPLICATION OF BOUNDARY-LAYER THEORY TO DISPERSION IN WELL-MIXED ESTUARIES,
Nielsen Engineering and Research, Inc., Mountain View, Calif.
G. D. Kuhn, and J. N. Nielsen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 288, $5.75 in paper copy, $2.25 in microfiche. Technical Report NEAR TR 63, September 1974. 129 p, 30 fig, 1 tab, 17 ref. OWRR C-3189(3698)(2).

Descriptors: *Estuaries, *Longitudinal dispersion, *Turbulent boundary layers, *Mixing, Flow, Water pollution, Momentum equations, Fluid friction, *Diffusion, *Path of pollutants, *Dispersion, Roughness(Hydraulic), Model studies.

A theory is presented for calculating the complete velocity field of long, well-mixed estuaries which vary in cross section. The method is based on boundary-layer theory in that the vertical profiles of velocity in the estuary are assumed to have the analytical form characteristic of turbulent boundary layers. That analytical form is used to calculate the vertical profiles of velocity after the lateral variation of the vertically averaged velocity and bottom shear stress have been calculated with the help of data obtained from a tidal model. Comparison of calculated velocity distributions with velocities measured in a real estuary indicate that the method gives good estimates of the complete velocity distributions in real estuaries. An important parameter in the calculation of velocity distributions was found to be related to the roughness of the bottom of the estuary. This parameter can be evaluated for a particular estuary from knowledge of the boundary roughness, or from comparison with a typical vertical velocity profile. Using the velocity distribution theory, a method was derived for calculating dispersion coefficients for use in a gross diffusion equation for estimating the dispersion of pollutants in the estuary. A method of determining the necessary eddy-viscosity variations for vertical mixing was developed for use with the formulation. Subsequent dispersion calculations indicated that the coefficients could adequately predict the dispersion of dye measured in the U.S. Army Engineers Delaware River Model.
W74-12858

OCCURRENCE AND DISTRIBUTION OF CLAY MINERALS AND TRACE METALS IN THE BOTTOM SEDIMENT OF BILOXI BAY, MISSISSIPPI,
Mississippi Univ., University. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 2L.
W74-12860

ANALYSIS OF NUTRIENT SUPPLIES FOR ALGAE IN ELEPHANT BUTTE RESERVOIR,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-12861

ANALYSIS OF WATER CHARACTERISTICS OF MANUFACTURING INDUSTRIES AND THEIR ADAPTABILITY TO SEMI-ARID REGIONS,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 3E.
W74-12863

TREATMENT OF LIQUID WASTES FROM CANE SUGAR INDUSTRY,
Puerto Rico Univ., Mayaguez. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-12865

COMPONENT DESCRIPTION OF SEDIMENT-WATER MICROCOSMS,
Utah State Univ., Logan. Center for Water Resources Research.
For primary bibliographic entry see Field 5C.
W74-12868

CHEMICAL AND BIOLOGICAL QUALITY OF SEWAGE EFFLUENTS,
Rutgers-the State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5D.
W74-12870

CHEMICAL AND BIOLOGICAL QUALITY OF MUNICIPAL SLUDGE,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-12871

EFFECTS OF LAND DISPOSAL OF WASTE-WATERS ON SOIL PHOSPHORUS RELATIONS,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-12880

EFFECTS OF LAND DISPOSAL OF WASTE-WATER ON EXCHANGEABLE CATIONS AND OTHER CHEMICAL ELEMENTS IN THE SOIL,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-12881

FACTORS AFFECTING NITRIFICATION-DENITRIFICATION IN SOILS,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5D.
W74-12882

BIOTOXIC ELEMENTS IN SOILS,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-12883

FINAL ELK RIVER REACTOR SITE SURVEY, RESULTS AND SUMMARY - JULY 23, 1974.
United Power Association, Elk River, Minn.
Report No COO-651-92, July 23, 1974. 72 p, 5 fig, 19 tab, 2 append.

Descriptors: *Monitoring, *Surveys, *Sites, *Nuclear powerplants, Radiation, Radioactivity, Radioisotopes, Background radiation, Assay, Measurement, *Environmental effects, Abatement, *Minnesota.
Identifiers: *Elk River Powerplant(Minn), Elk River.

A detailed post-dismantling radiation survey of the Elk River reactor site was completed during June and July of 1974. A survey was made prior to backfill of the reactor building cavity but after all sources of radiation were either removed from the site or packaged for shipping and disposal. The techniques and methods used during the final Elk River Reactor site survey are described and the results of the survey are presented. No evidence of radiation levels in excess of normal background was found during the final reactor site survey. The radiation levels detected on site are consistent with normal levels previously measured in the off-site environment during the routine environmental surveillance program. (Houser-ORNL)
W74-12903

FIELD INVESTIGATIONS OF HEATED DISCHARGES FROM NUCLEAR POWER PLANTS ON LAKE MICHIGAN: 1972,
Argonne National Lab., Ill.
A. A. Frigo, D. E. Frye, and J. V. Tokar.
Available from NTIS, Springfield, Va. 22161, as ANL/ES-32; $7.50/copy, $2.25 microfiche. Report No ANL/ES-32, March 1974. 241 p, 158 fig, 8 tab, 12 ref, 5 append, 1 biblio.

Descriptors: *Nuclear powerplants, *Effluents, *Lake Michigan, *Thermal pollution, *Water pollution, Water pollution sources, Temperature, Water cooling, Water temperature, Meteorology, Model studies, Data collections.
Identifiers: *Plume studies, *Thermal plumes.

A partial compilation is presented of thermal-plume field data collected during 1972 under the auspices of the Great Lakes Research Program, funded by the Atomic Energy Commission. Thirty thermal plumes are presented, 15 each for the Point Beach and Palisades Nuclear Power plants - both located on Lake Michigan. The 1972 data, together with studies performed in previous years, were obtained to demonstrate the variability of plume configurations under a wide range of environmental conditions and collectively are being used to test the validity of several widely used predictive model formulations. General observations of the field data on relation to ambient lake and meteorological conditions are presented. However, a more detailed analysis of the data will be reported separately. (Houser-ORNL)
W74-12904

ECOLOGY AND ANALYSIS OF TRACE CONTAMINANTS, PROGRESS REPORT JUNE 1972-JANUARY 1973.
Oak Ridge National Lab., Tenn.
Available from NTIS, Springfield, Va. 22161, as ORNL-NSF-EATC-1; $11.50/copy, $2.25 microfiche. Report No ORNL-NSF-EATC-1, March 1973. 453 p, 95 fig, 69 tab, 266 ref.

Descriptors: *Ecology, *Trace elements, *Soil contamination, *Water pollution, *Research and development, Technology, Analysis, Evaluation, Radioactivity, Ecosystems, Management, Toxicity, Measurement, Analytical techniques, Centrifugation, Solvent extractions, Public health.

The work reported is conducted within eight divisions of the Oak Ridge National Laboratory, plus the Environmental Information System. Several Task teams comprise personnel from more than one division. Accordingly, it is a multi-disciplinary activity. While the work is reported as 15 separate Tasks, it is emphasized that there is strong interaction among the various tasks which is indicated in a scheduling chart for the work and throughout the text where particularly appropriate. Interactions and relationships, both within the program and between the program and those of other institutions who will use the results of the EATC work are also discussed. Detailed reports of the 15 Tasks, an executive summary and a discussion of the organization and management of the program within ORNL, are presented. The work falls within several broad research areas incorporating both field and laboratory work. (See W74-12906 thru W74-12920) (Houser-ORNL)
W74-12905

DEVELOPMENT OF AN ENVIRONMENTAL UNIFIED TRANSPORT MODEL FOR TOXIC MATERIALS,
Oak Ridge National Lab., Tenn.

A. A. Brooks, R. D. Ellison, D. E. Fields, J. B. Mankin, and M. T. Mills.
In: Report No ORNL-NSF-EATC-1, p 27-59, March 1973. 3 fig, 28 ref.

Descriptors: *Model studies, *Hydrology, *Hydrologic data, *Systems analysis, Ion transport, *Air pollution, Water, Toxins, Toxicity, Public health, Water chemistry, Biological properties, Meteorology, Ecology, Evaluation, *Path of pollutants.

Operational submodels for hydrologic transport and air transport of toxic materials have been implemented. These two submodels have recently been merged to form the initial version of a Unified Transport Model. This unified model is currently being validated using 3 previous years of data from the Walker Branch Watershed and current data at the Oak Ridge site. Development of chemical and biological exchange submodels has begun but is presently in a preliminary phase. Estensive communication links have been established with workers in the fields of hydrology, meteorology, ecology, and other disciplines to insure that the final version of the Unified Transport Model will be of practical value. (See also W74-12905) (Houser-ORNL)
W74-12906

ENVIRONMENTAL MONITORING OF TOXIC MATERIALS IN ECOSYSTEMS,
Oak Ridge National Lab., Tenn.
A. W. Andren, J. A. C. Fortescue, G. S. Henderson, D. E. Reichle, and R. I. Van Hook.
In: Report No ORNL-NSF-EATC-1, p 61-119, March 1973. 23 fig, 9 tab, 18 ref.

Descriptors: *Monitoring, *Data collections, *Toxins, *Toxicity, *Abiotic environment, *Environmental control, *Biota, Ecology, Ecosystems, Trace elements, Hydrologic budget, Control, Water pollution, Watershed protection, Forest watersheds, Hydrologic models, Model studies, *Path of pollutants.

This Task is addressed to the problem of developing a useful body of information concerning natural and man-influenced levels of selected toxic and potentially toxic materials in both biotic and abiotic components of the environment. The long-term technical objectives include (1) development of trace contaminant profiles in a major forest ecosystem in east Tennessee; (2) synthesis of these data into an input-output budget of water and trace contaminants through a forested watershed; (3) development of ecological models for various subsystems within this watershed for describing and predicting the movement and accumulation of trace contaminants in ecological systems; and (4) development of a numerical data base through the Toxic Materials Information Center on trace contaminants to serve as a validation data set for the United Transport Model. The work reported for the first years effort is concerned primarily with levels of elements in soils, vegetation, animals, sediments, and water in east and west Tennessee. (See also W74-12905) (Houser-ORNL)
W74-12907

ECOLOGY OF TOXIC METALS,
Oak Ridge National Lab., Tenn.
B. G. Blaylock, R. A. Goldstein, J. W. Huckabee, S. Janzen, and C. Matti.
In: Report No ORNL-NSF-EATC-1, p 121-160, March 1973. 13 fig, 7 tab, 23 ref.

Descriptors: *Metals, *Toxins, Toxicity, *Ecology, *Ecosystems, *Mercury, *Cadmium, Movement, Cycling nutrients, Food chains, Absorption, Transfer, Ion transport, Radioactive tracers, Aquatic environment, Model studies, *Path of pollutants.

Experiments are described on the movement and concentration of mercury and cadmium in different ecosystems. Radiotracer techniques and stable chemical analyses were used in cycling and food chain studies in aquatic and terrestrial ecosystems. Direct uptake and transfer efficiencies through a simple aquatic food chain were determined for CH3 203HgCl, 203Hg(NO3)2 and 109Cd(NO3)2.. Methylmercury was much more efficiently transferred through the food chain than inorganic mercury or cadmium. A linear eight compartment model was developed to describe the dynamic redistribution of methylmercury in a pond ecosystem using data collected by radiotracer techniques. The general mobility of mercury and cadmium in terrestrial ecosystems and the extent to which they concentrate in various components were compared. (See also W74-12905) (Houser-ORNL)
W74-12908

TOXIC METALS IN LAKE AND RIVER SEDIMENTS,
Oak Ridge National Lab., Tenn.
E. A. Bondietii, R. M. Perhac, F. H. Sweeton, and T. Tamura.
In: Report No ORNL-NSF-EATC-1, p 161-195, March 1973. 7 fig, 8 tab, 13 ref.

Descriptors: Assessment, *Metals, *Toxins, Toxicity, Measurement, *Cadmium, *Zinc, *Sediments, Rivers, Streams, Assay, Analysis, Analytical techniques, Suspended solids, Sedimentology, Soils, Absorption, *Lake sediments, *Path of pollutants.
Identifiers: *Holston River, *Joe Mill Creek, Tennessee, Concentration.

Cadmium and zinc concentrations were determined in the sediments of two East Tennessee streams: (1) the Holston River near the Mascot (Tennessee) zinc beneficiation plant and (2) Joe Mill Creek, a stream flowing over a natural zinc outcrop. The cadmium concentration in the bottom sediment of the Holston is higher (approx 50 ppm) than in Joe Mill Creek (approx 3.5 ppm). The cadmium concentration in the suspended sediments of the Holston samples was similar to that in the associated bottom sediments; in the suspended sediments of Joe Mill Creek the concentration of cadmium was about five times that in the bottom sediments. The concentration of cadmium in the water during the fall season was between 2 and 3 ppb in both rivers, which is below the recommended limit of 10 ppb for drinking water supplies. (See also W74-12905) (Houser-ORNL)
W74-12909

ZONAL CENTRIFUGATION: APPLIED ASPECTS IN ELUCIDATING CHEMICAL AND BIOLOGICAL FORMS, DISTRIBUTION AND AVAILABILITY OF HEAVY METALS IN THE ENVIRONMENT,
Oak Ridge National Lab., Tenn.
F. N. Bolton, F. S. Brinkley, M. W. Callahan, C. W. Francis, and R. Levy.
In: Report No ORNL-NSF-EATC-1, p 197-226, March 1973. 1 fig, 11 tab, 12 ref.

Descriptors: *Heavy metals, *Centrifugation, *Water treatment, Water purification, *Cadmium, Vegetation, *Soils, *Absorption, *Desorption, *Chelation, Chemical reactions, Clays, Iron, Zinc, Metals, Environment, Selenium, Research and development, Ecosystems, Path of pollutants.

Work reported involved evaluating conditions which influence the availability of cadmium to plants and the adsorption of polyvinylpyrrolidone on clays. Polyvinylpyrrolidone (PVP) is a nonionic synthetic polymer used as a peptizing agent for clays in the nonaqueous density gradients used in zonal centrifugation of soils and sediments. In a series of separate experiments, factors which influence plant uptake of cadmium were evaluated. In nutrient solutions, factors investigated were the concentration of calcium, nitrogen, selenium and hydrogen. Cadmium uptake by plants was the same at pH 4 and at pH 6. However, if an iron chelating agent was used in the nutrient solutions as a source of iron, cadmium uptake was greater at the lower pH. Calcium and nitrogen amendments appeared to depress uptake of cadmium in plants. On the other hand, zinc in concentrations of 5 and 10 ppm enhance cadmium uptake as compared to solutions containing 1 ppm zinc. (See also W74-12905) (Houser-ORNL)
W74-12910

HYDROLYTIC BEHAVIOR OF TOXIC METALS,
Oak Ridge National Lab., Tenn.
C. F. Baes, Jr., and R. E. Mesmer.
In: Report No. ORNL-NSF-EATC-1, p 227-245, March 1973. 2 fig, 2 tab, 67 ref.

Descriptors: Research and development, *Metals, *Hydrolysis, *Chemical reactions, Hydrogen ion concentration, Behavior, Chemistry, *Toxins, *Reviews, Mercury, Zinc, Cadmium, Copper, Beryllium, Lead, Tin, Bismuth, Arsenic, Antimony.

Most metal ions hydrolyze in solutions of intermediate pH to produce a set of hydroxy complexes, Mx(OH)y(nx-y), whose identities are often unresolved and whose distributions depend on both metal ion concentration and pH. Identification of the formula and charge of these hydrolysis products is essential to understanding important aspects of the chemistry of the element. Ten important toxic metal ions have been selected for a critical review of the literature on their hydrolysis behavior. These are: Hg(2+), Zn(2+), Cd(2+), Cu(2+), Be(2+), Pb(2+), Sn(2+), Bi(3+), As(III) and Sb(III). Reviews of the first six of these are now complete so that the identity of the significant hydrolysis species has been judged and the best values selected for equilibrium quotients relating these to the acidity and the solid oxide and hydroxide phases which occur. (See also W74-12905) (Houser-ORNL)
W74-12911

DEVELOPMENT OF HIGH SENSITIVITY X-RAY FLUORESCENCE FOR ANALYSIS OF TRACE TOXIC ELEMENTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W74-12912

ENVIRONMENTAL APPLICATIONS OF CENTRIFUGAL PHOTOMETRIC ANALYSIS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W74-12913

SEPARATION, DETECTION, AND IDENTIFICATION OF ORGANICALLY BOUND TOXIC METALS AND OTHER HAZARDOUS MATERIALS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W74-12914

MEASUREMENT OF MOLECULAR ORGANIC CONTAMINANTS IN POLLUTED WATER,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W74-12915

RAPID N-15 ISOTOPIC-RATIO ANALYTICAL SYSTEM FOR ENVIRONMENTAL SAMPLES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W74-12916

REMOVAL OF MERCURY AND OTHER TOXIC METALS FROM PLANT EFFLUENT SOLUTIONS BY SOLVENT EXTRACTION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D.
W74-12917

ELECTROCHEMICAL REMOVAL OF REDUCIBLE INORGANIC POLLUTANTS FROM AQUEOUS STREAMS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D.
W74-12918

THE FLOW OF MERCURY IN SOCIETY,
Oak Ridge National Lab., Tenn.
W. E. Clark.
In: Report No. ORNL-NSF-EATC-1, p 391-407, March 1973. 2 fig, 3 tab, 10 ref.

Descriptors: *Mercury, Water pollution, *Water pollution sources, *Surveys, Data collections, Environmental effect, Waste disposal, Zinc, Manganese, Oxides, *Pollution abatement, *Path of pollutants.

About half of the known mercury reprocessors in the United States responded to a questionnaire concerning their output in 1970. Production from those responding was 579,788 lb compared with U.S. Bureau of Mines figures of 582,160 lbs for secondary mercury. The actual amount recycled must, therefore, have been considerably greater than that reported. A survey of the usage of mercury by agencies of the U.S. Government has been made. Returns received by February 1, 1973, from 577 sites and subagencies accounted for preliminary totals of 61,011 lbs of mercury in metal and chemical forms and 32,177 lb in manufactured items. Data on recycle and disposal practices are also included. Mercury insult to the environment can be decreased by recycling primary batteries. In 1968 about 1.2 million lb of mercury were used in primary battery manufacture, about 75% of which was in mercury batteries, and 25% in zinc primary batteries. The latter also used more than 19,000 tons of zinc as well as thousands of tons of MnO2 and carbon electrodes, recovery of which is technically feasible. A tentative flowsheet for recovery of these materials as well as mercury is included. (See also W74-12905) (Houser-ORNL)
W74-12919

TOXIC MATERIALS INFORMATION CENTER ENVIRONMENTAL INFORMATION SYSTEMS OFFICE,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W74-12920

EFFECT OF FLOODING AND CROPPING ON THE CHANGES IN THE INORGANIC PHOSPHATE FRACTIONS IN SOME RICE SOILS,
University of Agricultural Sciences, Mandya (India). Regional Research Station.
For primary bibliographic entry see Field 2G.
W74-12925

THE RECENT SEDIMENTS OF WINDERMERE,
Leicester Univ. (England). Botany Lab.
For primary bibliographic entry see Field 2J.
W74-12931

THE BIOLOGICAL MEASUREMENT OF WATER QUALITY,
Institute of Paper Chemistry, Appleton, Wis. Div. of Industrial and Environmental Systems.
For primary bibliographic entry see Field 5A.
W74-12932

PROTEIN RECOVERED FROM INDUSTRIAL WASTE WATER AS FEED FOR CHICKS,
Norges Landbrukshoegskole, Vollebekk. Dept. of Poultry and Fur Animal Science.
O. Herstad, and H. Hvidsten.
Acta Agriculturae Scandinavica, Vol 23, No 3, p 151-156, 1973. 7 tab, 10 ref.

Descriptors: *Sulfite liquors, *Lignins, *Sulfonates, *Pulp wastes, *Proteins, *Yeasts, *Poultry, Nutrients, Solid wastes, Industrial wastes, Pulp wastes, Pulp and paper industry, Byproducts, Waste water(Pollution), Effluents, Chemical precipitation, Food processing industry.
Identifiers: Lignoprotein, Animal fodder.

Lignoprotein produced by precipitating the proteins in waste waters from a herring fillet factory with lignosulfonic acids from a torula yeast plant (utilizing spent sulfite pulping liquors) was tested as a poultry fodder. Results indicated that up to 8.5% of lignoprotein can be used in chicken feed without harmful effects. (Buchanan-IPC)
W74-12933

INDUSTRIAL WASTES: PAPER AND APPLIED PRODUCTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-12941

BIOCHEMICAL DEGRADATION BEHAVIOR OF SULFITE PULP MILL WASTE WATER AND ITS CONSTITUENTS (BIOCHEMISCHES ABBAUVERHALTEN VON SULFITZELLSTOFFABWASSER UND SEINEN INHALTSSTOFFEN),
G. Otto.
Zellstoff und Papier, Vol 23, No 2, p 42-46, Feb 1974. 4 fig, 3 tab, 8 ref.

Descriptors: *Pulp wastes, *Biodegradation, *Carbohydrates, *Sulfite liquors, Biochemical oxygen demand, Chemical oxygen demand, Effluents, Activated sludge, Organic loading, Oxygen demand, Hardwood, *Waste water treatment, Industrial wastes.
Identifiers: Wash waters, Pulp washing, Glucose, Xylose, Rhamnose, Monosaccharides, Fagus(or Beech trees), Pulp mills, Sulfite pulp mills.

The composition of aqueous effluents from the pulp-washing stage of a sulfite pulp mill utilizing beechwood was determined, and the proportionate share of each effluent component in the COD and BOD of the total effluent was ascertained by an oxygen balance. In batch experiments, the rate of elimination of pure monosaccharides was determined singly and in mixtures, indicating that glucose was removed most rapidly, rhamnose most slowly. Considering their original concentration in the effluent, however, acetic acid and xylose showed the most rapid degradation. In a continuous model of biochemical waste water purification with activated sludge settling, the capacity for treating diluted effluent (800-1000 mg BOD/liter) approximated a volumetric loading of 42 g of BOD/liter/day. (Ward-IPC)
W74-12942

THE CHARACTERIZATION OF SPENT ALKALI/OXYGEN BLEACHING LIQUOR,
State University of New York, Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5A.
W74-12943

THE EFFECT OF SELECTED DYES IN THE ENVIRONMENT,
Crompton and Knowles Corp., Reading, Pa. Dyes and Chemicals Div.
For primary bibliographic entry see Field 5C.
W74-12950

DETERMINATION OF PHENOLS IN EFFLUENTS BY VOLTAMMETRY (OPREDELENIE FENOLOV V STOKAKH VOL'TAMPEROMETRICHESKIM METODOM),
Tsentralnyi Nauchno-Issledovatelski Lesokhimicheski Institut, Khimki (USSR).
For primary bibliographic entry see Field 5A.
W74-12964

INCREASE IN CONDUCTIVITY OF IRRIGATION WATER DURING SPRINKLING,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 3F.
W74-12966

PRODUCTION AND RELEASE OF RADIOACTIVE KRYPTON- AND XENON-ISOTOPES BY NUCLEAR POWER PLANTS AND REPROCESSING PLANTS AND THE EXPECTED RADIOLOGICAL BURDEN TILL THE YEAR 2000, (ERZEUGUNG UND FREISETZUNG VON RADIOAKTIVEN KRYPTON- UND XENON-ISOTOPEN DURCH KERNREAKTOREN UND WIEDERAUFARBEITUNG SANLAGEN UND DIE VORAUSSICHTLICHE RADIOLOGISCHE BELASTUNG BIS ZUM JAHR 2000),
Kernfurschungszantrum, Karlsruhe (West Germany).
For primary bibliographic entry see Field 5A.
W74-12971

EFFLUENTS FROM WASTE PAPER STOCK CLEANING (SCIEKI PO OCZYSZCZANIU MASY MAKULATUROWEJ),
Instytut Celolozowo-Papierniczy, Warsaw (Poland).
Z. Skwara.
Przeglad Papierniczy, Vol 30, No 2, p 64-66, Feb 1974. 3 tab, 12 ref.

Descriptors: *Recycling, *Pulp wastes, Waste water(Pollution), Waste treatment, *Waste water treatment, *Organic loading, *Biochemical oxygen demand, *Suspended solids, Industrial wastes, Solid wastes, Pulp and paper industry, Europe, Effluents, Pollution abatement, Biological treatment, Economics.
Identifiers: *Poland, Waste paper, Newsprint, Fine paper, Printing paper, Writing paper, White paper(Paper machine), Paperboard, Secondary fibers, Reclaimed fibers, Deinking, Inks, Printing inks, Board machines, Paper machines.

By 1980 A.D., waste paper may account for 40% of all fibers used for paper and board manufacture in Poland, including fine (writing and printing) grades which require prior deinking of printed wastes. Economic gains from reclaimed fiber usage may be partly offset by high effluent pollution loads in deinking mills, demanding better waste water purification. Investigations showed that the volume and the BOD load of effluents from deinked pulp stock increases from newsprint to mixed wastes to wood-fence (groundwood-free) waste paper. White water from the production of paperboard containing 10% of deinked waste paper fibers held 51% more suspended solids and 61% higher 5-day BOD than did ordinary board-machine white water. Available data indicate that waste water from paper mills using reclaimed fiber will require extensive biological treatment in addition to present mechanical methods. (Stapinski-IPC)
W74-12972

BUOYANT FORCED-PLUMES IN CROSS FLOW,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 8B.
W74-12978

THE DEPOSITION OF SULPHUR IN THE RAINWATER IN NORTHERN NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
A. R. Bromfield.
Tellus, Vol 26, No 3, p 408-411, 1974. 3 fig, 1 tab, 9 ref.

Descriptors: *Fallout, *Sulphur, *Data collections, *Surveys, Monsoons, Air pollution, *Rain water.
Identifiers: *Nigeria, Atmospheric sulphur, Harmattan.

The concentration and amounts of SO4-S were measured at eleven sites, situated between 350 and 880 kilometres from the sea, during the rainy seasons in 1970 and 1971 in Northern Nigeria. In both years, concentrations showed a similar pattern at each site, being greatest at the beginning and end and smallest at the peak of the rains. The presence of anthropogenic atmospheric-S at the start of the rains, and of harmattan dust and lower precipitation at the beginning and end of the rains account for the concentration pattern observed. Amounts of S deposited ranged from 0.49-1.89, mean 1.14 kg S/ha. An estimate of dry deposition of S was made from the intercept on the y axis of a plot of amount deposited against rainfall. The dry deposition rates were 0.26 times 10 to the minus 12th power and 0.43 times 10 to the minus 12th power g S/sq cm/s. (Humphreys-ISWS)
W74-12980

SWIRLING SHALLOW SUBMERGED TURBULENT PLUMES,
Colorado Univ., Boulder. Dept. of Aerospace Engineering Science.
J. P. Narain.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY9, Proceedings Paper 10820, p 1229-1243, September 1974. 4 fig, 1 tab, 16 ref, 2 append.

Descriptors: *Free surfaces, *Thermal pollution, *Subsurface flow, *Jets, Mathematical models, Buoyancy, Density, Temperature, Velocity, Turbulent flow, *Path of pollutants.
Identifiers: *Submerged jets, *Swirling axial jets, Momentum, Flow establishment, Richardson number.

A mathematical model, using method of images and flux conservation equations, was developed to investigate the flow field produced by a swirling plume near a free surface. Various degrees of swirl and various depths of jet submergence were studied. The maximum axial velocity, swirl velocity, and the temperature excess loci migrated towards the free surface downstream from the orifice. The rate of migration towards the free surface increased for axial velocity, temperature excess, and the swirl velocity loci taken in ascending order. Increased initial swirl reduced the spread of the jet in the axial or downstream direction. The maximum temperature excess also occurred closer to the jet orifice with increased swirl. This was achieved at the exposure of increased lateral spread of the plume. Increased submergence of the jet resulted in increased lateral and longitudinal spread of the plume. (Adams-ISWS)
W74-12989

MIREX: AN UNRECOGNIZED CONTAMINANT OF FISHES FROM LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W74-12990

CHEMICAL WATER TYPES AND THEIR DISTRIBUTION IN SPACE AND TIME IN THE AMSTERDAM DUNE-WATER CATCHMENT AREA WITH ARTIFICIAL RECHARGE,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 4B.
W74-13004

AN OBSERVATION OF RAPID THERMOCLINE FORMATION IN THE MIDDLE-ATLANTIC BIGHT,
Delaware Univ., Newark. Coll. of Marine Studies.
T. D. Myers.
Estuarine and Coastal Marine Science, Vol 2, p 75-82, 1974. 3 fig, 2 tab, 10 ref.

Descriptors: *Delaware, *Coasts, *Waste disposal, *Density stratification, Continental shelf, Mixing, Salinity, Thermal stratification, Temperature, Isotherms, *Thermocline.
Identifiers: Expendable bathythermograph system.

A time-series temperature profile was constructed from expendable bathythermograph system drops made during the spring of 1973 at an industrial waste disposal site off the coast of Delaware. Isothermal conditions were found throughout the water column until mid-April. Surface warming was sudden and accomplished without detectable return to isothermy. Thermocline formation is attributed to a combination of vernal warming and influx of a warm water mass from the southeast. No appreciable deepening of the thermocline was observed in the month following its formation. The rate of near-surface warming was greatly reduced after thermocline formation. Short-term incursions of warm bottom water were observed on two occasions, one before thermocline formation and one after thermal stratification. Density stratification in the area is primarily thermally induced in the period following thermocline formation. (Yang-ISWS)
W74-13005

METHYLMERCURY: BACTERIAL DEGRADATION IN LAKE SEDIMENTS.
Midwest Research Inst., Kansas City, Mo.
W. J. Spanger, J. L. Spigarelli, J. M. Rose, and H. M. Miller.
Science (Wash DC). 180(4082): 192-193. Illus. 1973.

Descriptors: *Mercury, Lakes, Sediments, Spectrometers, Mass spectrometry, *Gas chromatography, Bacteria.
Identifiers: *Methymercury.

During the first 50 days of a long-term period of incubation of lake sediments with inorganic mercury (Hg2+), low concentrations of methylmercury were observed to build up. Upon continued incubation there was a rapid decrease in amount of methylmercury in the system and a concomitant evolution of volatile inorganic mercury (Hg0). Transfer to the mixed culture to growth media containing methylmercury resulted in the degradation of methylmercury and the volatilization of Hg0. Bacterial isolates were obtained from the mixed culture which, in pure culture, rapidly degraded methylmercury to methane and Hg0. The presence of methane in head space gases was confirmed by flame-ionization gas chromatography, and the presence of Hg0 in head space gases was confirmed by mass spectrometry.--Copyright 1973, Biological Abstracts, Inc.
W74-13038

EPIZOIC ALGAE IN SEWAGE WATERS, (IN RUSSIAN),
Kharkov State Univ. (USSR).
A. M. Matvienko.
Gidrobiol Zh. Vol 8, No 2, p 56-62, 1972. English summary.
Identifiers: *Algae, Characiochloris, Chlorangiopsis, Chlorobion, Colacium, Gloxidium, Hyaloraphidium, Korshikoviella, Rhopalosolen, *Sewage, *Epizoic algae, Self-purification.

Specific and intraspecific taxa of 27 epizoic algae found in sewage waters were discussed. This number included 1 taxon of Euglenophyta (Colacium vesiculosum) and 26 taxa of Protococcineae: Korshikoviella (10), Hyaloraphidium (6), Chlorangiopsis (5), Characiochloris (2), Rhopalosolen (2), Gloxidium (1) and Chlorobion (1). The algae can endure considerable contamination. Developing in mass, they play an important role in sewage self-purification.--Copyright 1974, Biological Abstracts, Inc.
W74-13041

CONTAMINATION OF CHANNEL CATFISH WITH DIELDRIN FROM AGRICULTURAL RUNOFF,
Iowa Cooperative Fisheries Research Unit, Ames.
For primary bibliographic entry see Field 5C.
W74-13050

EFFECTS OF OFFAL DISPOSAL FROM ANIMAL PROCESSING PLANTS ON WATER QUALITY AND AQUATIC LIFE OF NATURAL STREAMS,
Mississippi State Univ., State College. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 5C.
W74-13053

MICROBIAL CO-OXIDATION OF HALOGENATED AROMATIC COMPOUNDS,
Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
R. W. Traxler.
Completion Report, July 1974, 4 p. OWRT A-045-RI(1). 14-31-0001-3840.

Descriptors: Halogenated pesticides, Pollutant identification, Oxidation, Pesticides, Bacteria, *Microbial degradation, Isolation, Aromatic compounds, Chlorinated hydrocarbon pesticides, Gas chromatography, Separation techniques.
Identifiers: *Co-oxidation, Enrichment techniques.

Bacteria have been isolated by enrichment techniques which utilize sodium benzoate, indene and diphenylethane. Some of these isolates growing on the isolation substrate with heptachlor or DDT present have shown by respirometeric methods to co-oxidize the chlorinated aromatic compound. Gas chromatographic analyses have indicated the oxidation of heptachlor in these systems.
W74-13057

RECENT SOCIOLOGICAL CONTRIBUTIONS TO WATER RESOURCES MANAGEMENT AND DEVELOPMENT,
Kentucky Univ., Lexington. Center for Developmental Change.
For primary bibliographic entry see Field 6B.
W74-13064

CADMIUM CONTENT AND DISTRIBUTION IN THE MUD, BLOOD CLAMS, FISH FLESH AND THE ALGA, PORPHYRA TENERA, IN THE ARIAKE BAY (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries Chemistry.
S. Ishio, N. Ohba, Y. Tanaka, and S. Tadokoro.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 39, No 6, p 705-712, June, 1973. 7 fig, 4 tab, 7 ref. (English summary).

Descriptors: *Cadmium, *Public health, *Bottom sediments, Metals, Water pollution sources, Food chains, Algae, Fish, Zinc, Industrial wastes, *Path of pollutants, Toxicity, Absorption, Adsorption.
Identifiers: Blood clams, Porphyra tenera, *Japan(Ariake Bay).

Ariake Bay has been polluted by cadmium from the wastes of zinc metallurgical plants of Ohmuta. Analysis of cadmium content revealed that contamination of bottom mud was developing from the river mouth of Ohmuta to almost all waters in the bay. The cadmium content in the dry mud ranged from 0.4 to 15 ppm. Based on an upper safety limit of 0.3 mg/day/person of cadmium, it was calculated that the intake of shucked blood clams should be restricted to 90-300 g/day/person. On the other hand, no cadmium was detected substantially in fish flesh and it was therefore considered harmless. Cadmium in Porphyra tenera ranged from 0.3 to 4 ppm dry matter. This suggests no cause for concern, because the quantity of this alga taken as food in a day is not sufficient to result in a large intake of cadmium. (Katz)
W74-13073

PCB CONTENTS IN MARINE ANIMALS IN TOKYO BAY, (IN JAPANESE),
Tokai Regional Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W74-13083

DISTRIBUTION OF BOTTOM FISHES IN RELATION TO OXYGEN CONTENTS IN THE BOTTOM WATER OR OMURA BAY, (IN JAPANESE),
Nagasaki Prefecture Fisheries Experiment Station (Japan).
For primary bibliographic entry see Field 5C.
W74-13086

PROBLEMS WITH DUMPING OF RED MUD IN SHALLOW WATERS. A CRITICAL REVIEW OF SELECTED LITERATURE,
Bundesforschung sanstalt fuer Fischerei, Hamburg (West Germany). Institut fuer Kuesten- und Binnenfischerei Isotopenlaboratorium.
For primary bibliographic entry see Field 5C.
W74-13091

ORGANOCHLORINE RESIDUES, MERCURY, COPPER AND CADMIUM IN YELLOW PERCH, WHITE BASS AND SMALLMOUTH BASS, LONG POINT BAY, LAKE ERIE,
Ontario Ministry of Natural Resources, Port Dover.
For primary bibliographic entry see Field 5C.
W74-13093

ACCUMULATION OF SR IN MARINE ORGANISMS- I. STRONTIUM AND CALCIUM CONTENTS, CF AND OR VALUES IN MARINE ORGANISMS,
National Inst. of Radiological Sciences, Chiba (Japan). Dept. of Environmental Contamination.
For primary bibliographic entry see Field 5C.
W74-13098

ON THE EFFECTS OF DUMPED ORGANIC INDUSTRIAL WASTE DERIVING FROM THE PRODUCTION OF PROTEOLYTIC ENZYMES ON DENSITY, DISTRIBUTION AND QUALITY OF FISH AND SHRIMPS,
Ministere de l'Agriculture, Ostend (Belgium). Sea Fisheries Research Station.
For primary bibliographic entry see Field 5C.
W74-13102

RADIATION DATA-WATER.
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-13111

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE QUAD-CITIES STATION, CORDOVA, ILLINOIS, JULY 1968.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-13112

SURVEY OF MERCURY USAGE BY AGENCIES OF THE UNITED STATES GOVERNMENT DURING 1971,
Oak Ridge National Lab., Tenn.
W. E. Clark.
Available from NTIS, Springfield, Va 22161 as ORNL-NSF-EATC-4; $6.25/copy, $2.25/microfiche. Report No ORNL-NSF-EATC-4, March 1974. 172 p, 2 tab, 3 ref, 4 append.

Descriptors: *Mercury, *Surveys, Statistical methods, *Federal government, *Waste disposal, Waste dumps, Data collections, Metals, Chemicals, Industrial production, Industrial wastes, Heavy metals.

Twenty-three major agencies of the U.S. Government were questioned relative to the quantities of mercury used, usage patterns, amounts recovered and recycled, and final disposal practices. Of these major agencies eight reported negligible usage, twelve submitted essentially complete questionnaires, two submitted limited responses and one promised a limited response which has not been received. Six hundred and seventy-nine responses were obtained from individual sites or subagencies. Total mercury accounted for was 101,150 lb of which 71,580 was used as metal, 2880 in chemicals and 26,690 in manufactured items. The total usage amounts to less than 3% of the reported national usage in 1971. About 270 sites recover or recycle mercury to some extent. The amount reported (a minimum) was 30,710 lb, about 30% of the total usage. A few sites submitted details of their antipollution and recycle procedures. Most sites landfill their solid wastes; some segregate mercury-containing waste for burial in isolated areas. Detailed data for each site reporting are summarized. (Houser-ORNL)
W74-13113

ENVIRONMENTAL MONITORING AT ARGONNE NATIONAL LABORATORY: ANNUAL REPORT FOR 1973,
Argonne National Lab., Ill. Occupational Health and Safety Div.
J. Sedlet, N. W. Golchert, and T. L. Duffy.
Available NTIS, Springfield, Va 22161 as ANL-8078; $4.75/copy, $2.25/microfiche. Report No ANL-8078, March 1974. 85 p, 5 fig, 32 tab, 24 ref, 4 append.

Descriptors: *Monitoring, Environment, *Environmental effect, *Radioactivity, *Nuclear powerplants, *Effluents, *Streams, Toxins, Chemicals, Measurement, Assessment, Safety, Evaluation, Air pollution, Water pollution, Soil contamination, Vegetation, Absorption, Milk, Fallout, *Illinois.
Identifiers: Argonne site(Ill), Sawmill Creek(Ill), *Des Plaines River(Ill).

The Argonne National Laboratory conducts a continuous environmental monitoring program on and near the Argonne site whose primary purpose is to determine the magnitude, origin, and identity of any radioactive or potentially toxic chemical substance present in the environment. The results of the environmental monitoring program at the Laboratory for 1973 are presented and discussed. To evaluate the effect of Argonne operations on the environment, measurements were made for a variety of radionuclides in air, surface water, Argonne effluent water, soil, grass, benthos, and milk; for a variety of chemical constituents in surface and Argonne effluent water; and of the environmental penetrating radiation dose. Sample collections and measurements were made both on and off the Argonne site for comparison purposes. The results of the program are interpreted in terms of the sources and origin of the radioactive and chemical substances (natural, fallout, Argonne, and other) and are compared with accepted environmental quality standards. (Houser-ORNL)
W74-13114

THE DISTRIBUTION OF PLUTONIUM IN LIQUID WASTE DISPOSAL AREAS AT LOS ALAMOS,
Los Alamos Scientific Lab., N. Mex.
T. E. Hakonson, L. J. Johnson, and W. D. Purtymun.
Available from NTIS, Springfield, Va 22161 as LA-UR-73-1309, $3.25/copy, $2.25/microfiche. In: 3rd International Congress of the International Radiation Protection Association Meeting, Washington, D.C., September 9, 1973. Conference 730907-13. Report No LA-UR-73-1309, 1973. 6 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Plutonium, *Distribution, *Waste disposal, *Liquid wastes, *Assay, Ecology, Sediments, Water, Vegetation, Rodents, Surface waters, Groundwater, Streams, Soils, *New Mexico.
Identifiers: *Mortandad Canyon(N Mex).

An ecological investigation of plutonium in the Los Alamos Scientific Laboratory environs is described. Data are presented on the distribution of plutonium in the alluvial sediments, water, vegetation and rodents from Mortandad Canyon, an area which has been used for liquid waste disposal for 10 years. The plutonium content of all sample materials except rodents was sufficient to reduce the relative standard deviations of the determination to less than 30% (based on counting statistics). However, the generally low levels of plutonium in rodent tissues in combination with the small sample masses resulted in relative standard deviations usually greater than 30%. (Houser-ORNL)
W74-13117

THE INTERAGENCY CONFERENCE ON THE ENVIRONMENT - A POST-CONFERENCE SURVEY,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6G.
W74-13118

TRANSURANIC SOLID WASTE MANAGEMENT RESEARCH PROGRAMS - QUARTERLY REPORT, OCTOBER-DECEMBER 1973.
Los Alamos Scientific Lab., N. Mex.
Available from NTIS, Springfield, Va. 22161 as LA-5614-PR; $4.25/copy, $2.25/microfiche. Report No LA-5614-PR, May 1974. 59 p, 10 fig, 16 tab, 50 ref.

Descriptors: *Management, *Radioactive wastes, *Reviews, *Solid wastes, *Plutonium, Waste storage, Corrosion, Waste treatment, Safety, Evaluation, Assay, Assessment, Abiotic environment, Biota, Transport, Biology.
Identifiers: Radiolysis, Waste burial, Organ dose, *Transuranics.

A review is presented of the progress for three transuranic solid waste management research programs funded by the AEC Division of Waste Management and Transportation during the period of October-December 1973. The interim storage criteria, which were reviewed by AEC administrative and contractor personnel, will be revised and submitted to AEC Headquarters for further comment. The experimental conditions for the studies of corrosion in humid air have been revised to better simulate conditions expected in closed-pad storage. In addition to bare mild-steel and stainless-steel samples, mild-steel coupons coated with several rust-inhibiting compounds are being studied. Radiolysis studies of typical waste materials contaminated with 238Pu have thus far produced

between 0.56 and 41.01 kPa of gas per simulated year. Waste sorting studies are being used to evaluate the newly developed Multi-Energy Gamma Assay System (box counter). Incinerator type and design feed rate have been selected for the Transuranic-Contaminated Solid Waste Treatment Development Facility, and operational parameters selected. The risk analysis method to be used in the evaluation of past burial practices has been described. Several parameters have been evaluated from literature sources, and equations to estimate organ doses have been derived. A radionuclide inventory of Los Alamos Scientific Laboratory (LASL) disposal area has been compiled. (Houser-ORNL)
W74-13120

HOURLY AVERAGE CONCENTRATIONS OF POLLUTANTS DUE TO POINT EMISSIONS NEAR TO THE GROUND - A PROBABILISTIC APPROACH,
Commissariat a l'Energie Atomique, Paris (France).
For primary bibliographic entry see Field 5A.
W74-13124

RELEASES OF RADIOACTIVITY IN EFFLUENTS AND SOLID WASTE FROM NUCLEAR POWER PLANTS IN 1972.
Oak Ridge National Lab., Tenn. Nuclear Safety Information Center.
Nuclear Safety, Vol 15, No 3, p 311-316, May-June, 1974. 10 tab, 5 ref.

Descriptors: *Monitoring, *Radioactivity, *Radioactive waste disposal, *Management, *Assessment, *Effluents, Streams, *Nuclear powerplants, Regulation, Gases, Liquid wastes, Solid wastes, Data collections, Public health, Research and development.

During the operation of nuclear power reactors, radioactive materials are produced by fission of the nuclear fuel and by neutron interaction with metals and materials in reactor systems and impurities in reactor coolant water. A small fraction of these radioactive materials enters the plant's waste systems and is channeled into various effluent streams. Presented is a tabulation of radioactivity in effluents and solid waste from nuclear power plants for calendar year 1972. The data included are those reported by the licensee except for certain calculations made by the AEC Regulatory Staff. A similar report was made for 1971. The radioactivity in effluents from licensed nuclear power plants has generally been low in comparison with the limits set forth in the U.S. Atomic Energy Commission's 10 CFR, Part 20, Standards for Protection Against Radionuclides. (Houser-ORNL)
W74-13125

A PROPOSED INTERIM STANDARD FOR PLUTONIUM IN SOILS,
Los Alamos Scientific Lab., N. Mex.
J. W. Healy.
Available NTIS, Springfield, Va 22161 as LA-5483-MS. $5.75/copy, $2.25/microfiche. Report No LA-5483-MS, January 1974. 101 p, 17 fig, 23 tab, 141 ref, 3 append.

Descriptors: *Standards, *Plutonium, *Fallout, *Air pollution, *Water pollution, *Soil contamination, *Soil contamination effects, Human population, Toxicity, Food chains, Public health, Control, Human diseases.
Identifiers: Cancer.

Current standards for controlling health effects from plutonium in the body are discussed. Available information on possible sources of exposure of people living in an area where the soils are contaminated with plutonium is analyzed to arrive at estimates of intake. From these estimates, a recommended interim standard for the upper limit of concentration of plutonium in the soils in inhabited areas is derived. The recommendation is based upon conservative assumptions where information is lacking and further studies should result in revision. Resuspension, deposition velocity of particles and effectiveness of radioactive particulates in producing lung cancer are discussed. (Houser-ORNL)
W74-13136

THE MATHEMATICAL MODELING OF SOIL-WATER-NITROGEN PHENOMENA,
Oak Ridge Natioaal Lab., Tenn.
F. J. Endelman, G. E. P. Box, J. R. Boyle, R. R. Hughes, and D. R. Keeney.
Available from NTIS, Springfield, Va 22161 as EDFB-IBP-74-8. $4.25/copy, $2.25/microfiche. Report No EDFB-IBP-74-8, July 1974. 75 p, 19 fig, 10 tab, 34 ref.

Descriptors: *Model studies, *Mathematical models, *Soil moisture, *Desorption, *Retention, Hydraulic conductivity, Pores, Soils, Loam, Sands, Forest soils, Heating, Ammonification, Nitrification.
Identifiers: Pore size distribution theory, Immobilization.

A non-linear mathematical model is developed for the characteristic curve of soil moisture desorption. The four parameters in the model are estimated from moisture retention data of a Wisconsin Plainfield loamy sand. The unsaturated hydraulic conductivity of water in this soil is calculated with this model and an equation based on pore size distribution theory. These estimates are compared with field data on the same soil. Results are also reported for a study of the ammonification, immobilization, and nitrification of nitrogen in a forest soil. Data for building linear models of these three transformations were obtained from 27 factorial experiments in which intact soil cores were incubated at different temperatures after treatment with aqueous mixtures of NH4-N and NO3-N in variable concentrations. (Houser-ORNL)
W74-13138

DEPOSITION OF RIVER SILTS IN THE RHINE AND MEUSE DELTA,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
H. L. Golterman.
Freshwater Biol. Vol 3, No 3, p 267-281. 1973. Illus.

Descriptors: *Silts, Sediments, Mud, *Rivers, Estuaries, Lakes, Water pollution, Pollutants, Path of pollutants, Pollutant identification, Water pollution sources, Fertilization, Leaching, Erosion, Deltas, Flocculation, Salinity, Sediment transport.
Identifiers: Calcium carbonate, *Meuse River, Netherlands, *Rhine River.

Due to erosion and leaching the rivers contain considerable quantities of silt (mud). It is estimated that the Rhine carries a mean value of 60-70 g/cu m; the variation of the mud content as a function of water discharge shows values up to several hundreds of grams/cu m. The annual supply of mud from these sources is around 4 million tons of dry matter. Near the river mouth, changes in water current velocity and other water movements result in deposition of the river silts. A further important factor is the change in salinity, which causes flocculation and deflocculation. The large deposits of the Rhine silt are rather fertile, which has a great influence on the growth of both the rooted and the suspended vegetation. Enormous amounts of peat can be found as layers formed in periods of a relatively low sea level, in which the sediments were comparatively dry. Due to a temporary elevation of the sea level, new layers of silt were formed on top of the peat. Originally only lands that fell dry during low sea level were reclaimed; later on, lands a few meters below sea level were reclaimed. Lakes were formed mostly by human action; in the older days peat digging, and now sand digging have created large but shallow lakes, of which the water is more or less standing groundwater. The water may still contain a large quantity of humic acids from the remaining peat. Due to the influence of the sea deposits, $CaCO_3$ is also present in large amounts. These factors together render the lake waters rich in humus and alkaline (pH 7-10). Most of the lakes serve as reservoirs for the surrounding agricultural areas. The water movement in spring and summer is therefore opposite to that in fall and winter. This fact and the short renewal times of these lakes cause large chemical and biological changes in which the influence of the sediments on the chemistry of the overlying water plays an important role--Copyright 1974, Biological Abstracts, Inc.
W74-13155

QUANTITY OF BACTERIA AND DESTRUCTION OF ORGANIC MATTER IN BOTTOM DEPOSITS OF THE SARATOV WATER STORAGE BASIN (IN RUSSIAN),
N. E. Yarushek.
Gidrobiol Zh. Vol 9, No 1, p 83-85. 1973. Illus.
Identifiers: *USSR(Saratov River basin), *Biodegradation, Bacteria, Microorganism, Oxygen, Saprophyte, *Organic matter, *Benthos, *Denitrification.

Microbiological investigations of benthic sediments in the Saratov Water Basin (USSR) revealed a total microorganism count reaching 2 x 10 to the 9th power/g with especially high values in slime; a saprophyte count of 562,000/g, a phenol-degrading bacteria count of 393,000/g, a denitrifying bacteria count of 2000/g and O2 consumption values reaching 441 mg of O2/cu m/day. Intense, mainly aerobic degradation of organic matter within the surface layer of the benthic sediment was determined.--Copyright 1974, Biological Abstracts, Inc.
W74-13156

CHARACTERISTICS OF BACTERIA IN WATER LAYERS OF THE SOUTH BAIKAL, (IN RUSSIAN),
G. A. Goman.
Gidrobiol Zh. Vol 9, No 1, p 85-88. 1973. Illus.
Identifiers: *Bacteria, *Eubacteriaceae, *Mycobacteriaceae, *USSR(Lake Baikal).

A study of the seasonal and vertical distribution of microorganisms in the South Baikal (USSR) revealed maximum populations and biomasses within the upper 50 m layer of water during May, June and Sept. and minimum counts in Nov. Cocci, predominant in the surface layer, give way to bacilli, Mycobacteriaceae and Eubacteriaceae in deeper layers.--Copyright 1974, Biological Abstracts, Inc.
W74-13157

THE RELATIONSHIP BETWEEN SEWERS, ENVIRONMENTAL POLLUTION AND BACTERIA THAT ARE RESISTANT TO ANTIMICROBIAL AGENTS, (IN AFRIKAANS),
National Inst. for Water Research, Pretoria (South Africa).
W. O. K. Grabow.
Tydskr Natuurwet. Vol 13, No 2, p 96-99. 1973. English summary.
Identifiers: *Bacteria, *Human diseases, Drugs, *Sewers, *Pathogenic bacteria, Public health.

The therapeutic value of antimicrobial drugs is diminishing due to the rapid increase of resistant bacteria. Initially the problem was limited to bacteria with chromosomal mutations which provide resistance to low concentrations of one antimicrobial drug. Today, however, bacteria carrying R factors (small nucleic acid elements) which confer resistance to high concentrations of a spectrum of antimicrobial drugs, are of exceeding im-

portance. Normal inhabitants of the digestive tract can transfer these factors to pathogenic organisms. Bacteria carrying R factors are abundantly present in sewage from where increasing numbers reach water sources like rivers, dams and even beaches. Steps are needed to protect man and animals against these bacteria which render antimicrobial treatment of many diseases ineffectual.--Copyright 1974, Biological Abstracts, Inc.
W74-13158

LEPTOSPIRES FROM WATER SOURCES AT DIXON SPRINGS AGRICULTURAL CENTER,
Illinois Univ., Urbana. Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5A.
W74-13160

NITROGEN TRANSFORMATIONS AND AVAILABILITY OF AN ANAEROBICALLY DIGESTED SEWAGE SLUDGE IN SOIL,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. A. Ryan, D. R. Keeney, and L. M. Walsh.
J Environ Qual. Vol 2, No 4, p 489-492. 1973.

Descriptors: Sludge, *Sewage sludge, Soils, Loam, Sands, Nitrification, Denitrification, Chemical analysis, *Aerobic treatment, Water treatment, Waste treatment, Nitrogen, Fertilizers, Nitrogen compounds.

Samples (50 g) of Warsaw sandy loam soil (Typic Argiudoll) were incubated under aerobic conditions with varying levels of an anaerobically digested sewage sludge (up to 1880 ppm N on an oven-dry soil basis). Total N, NH4-N, (NO3+NO2)-N, NH3 volatilization, and hydrolyzable forms of N were determined periodically during 16 wk of incubation at room temperature (23 plus or minus 3 degrees). At low levels (less than or equal to 235 ppm N), the inorganic N was all converted to (NO3+NO2)-N while at the higher levels (greater than or equal to 940 ppm N), a significant amount of NH4-N was not nitrified even after 16 wk of incubation. Recovery of added N was nearly quantitative at the low levels of sewage sludge addition. However, at the higher levels, there was evidence of concurrent nitrification-dentrification. The hydrolyzable N distribution results indicated that very little of the hydrolyzable N was mineralized at the low rates of application. At the high rates of application, apparent development of anaerobic conditions led to more rapid mineralization of the sewage sludge organic N than was found under aerobic conditions. From 4 to 48% of the organic N in the sewage sludge was mineralized to (NO3+NO2)-N in 16 wk. The availability of sewage sludge organic N must be considered when evaluating the potential of the material as a fertilizer or a possible source of NO3-N to ground waters.--Copyright 1974, Biological Abstracts, Inc.
W74-13163

SOLUBILIZATION OF HYDROCARBONS BY THE DISSOLVED ORGANIC MATTER IN SEA WATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5D.
W74-13166

DISTRIBUTION OF CHLORINATED HYDROCARBONS IN STREAM-BOTTOM MATERIAL,
Geological Survey, Menlo Park, Calif.
D. F. Goerlitz, and L. M. Law.
Journal of Research, US Geological Survey, Vol 2, No 5, p 541-543, September-October, 1974. 8 tab, 13 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Bottom sediments, *Particle size, *Path of pollutants, Suspended load, Bed load, Distribution patterns, Sampling, Sorption.

Six stream-bottom samples, contaminated in situ with high levels of chlorinated hydrocarbons, were size graded, and the separates were analyzed. The contaminants were found distributed throughout the sample. The complexity of bottom-material samples is such that the distribution of chlorinated hydrocarbons may be controlled to a major extent by the organic matter and associated organisms. All particle-size fractions must be considered if representative samples are to be taken and quantitatively related to a stream. (Knapp-USGS)
W74-13183

RECONNAISSANCE STUDY OF SELECTED NUTRIENTS, PESTICIDES, AND TRACE ELEMENTS IN THE EEL, SALINAS, AND SANTA ANA RIVERS, CALIFORNIA, OCTOBER 1971 THROUGH JULY 1972,
Geological Survey, Menlo Park, Calif.
G. A. Irwin, and M. Lemons.
Water-Resources Investigations 16-73, March 1974. 55 p, 6 fig, 15 tab, 15 ref, 3 append.

Descriptors: *Nutrients, *Pesticides, *Trace elements, *California, Water quality, Rivers, Sampling, Water pollution sources, Path of pollutants.
Identifiers: Eel River(Calif), Salinas River(Calif), Santa Ana River(Calif).

Nutrients, trace elements, and pesticide compounds were in low concentrations in the Eel River and were somewhat higher in parts of the Salinas and Santa Ana Rivers, California. Nitrate and orthophosphate ranged from a maximum of 0.3 mg/liter and 0.11 mg/liter in the Eel River to a maximum of 9.1 mg/liter and 13 mg/liter in the Santa Ana River. Concentrations of trace elements in the Eel River were generally low or below detectable limits, while these same trace elements were usually present in higher concentrations in most parts of the Salinas and Santa Ana Rivers. Pesticide compounds were not detected in the Eel River in either the water or bottom sediment, whereas in the Salinas and Santa Ana Rivers pesticide compounds were detected in both the water and bottom sediment. The concentrations were quite different between sampling sites within individual rivers. Within-river differences in concentrations were the most noticeable in the Salinas and Santa Ana Rivers. Most of the variability in these rivers was probably the result of sewage effluent and agricultural return water. (Knapp-USGS)
W74-13195

SUMMARY GROUND-WATER RESOURCES OF BEAVER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13200

SUMMARY GROUND-WATER RESOURCES OF WASHINGTON COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13201

SUMMARY GROUND-WATER RESOURCES OF WESTMORELAND COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13202

SUMMARY GROUND-WATER RESOURCES OF BUTLER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13203

SUMMARY GROUND-WATER RESOURCES OF ALLEGHENY COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13204

SUMMARY GROUND-WATER RESOURCES OF ARMSTRONG COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4B.
W74-13205

CHANGES IN SEDIMENT LOADS IN RIVERS OF THE ATLANTIC DRAINAGE OF THE UNITED STATES SINCE 1900,
Geological Survey, Woods Hole, Mass.
R. H. Meade, and S. W. Trimble.
In: Effects of Man on the Interface of the Hydrological Cycle with the Physical Environment, Symposium: International Association of Hydrological Sciences Publication No 113, p 99-104, 1974. 5 fig, 10 ref.

Descriptors: *Sediment load, *Rivers, *Atlantic Coastal Plain, *United States, Sediment yield, Sediments, Reservoirs, Soil conservation, Land use, Sediment transport, Channel erosion, Soil erosion, Erosion control.

Changes in sediment loads in the Atlantic drainage of the United States can be related to construction of reservoirs and changes in land use. Sediment loads have decreased immediately downstream from reservoirs but the persistence of large loads at points farther downstream indicates that the river channels themselves are not being degraded. The decline of crop farming and the improvment of soil-conservation practices have also decreased the sediment yields, but this reflected mainly in the sediment loads of the tributary streams; as yet, there has been no corresponding marked decrease in the sediment loads in most of the main-stem rivers. (Knapp-USGS)
W74-13215

P, N:P STANDARDS FOR HAWAIIAN STREAMS,
Hawaii Univ., Honolulu. Water Resources Research Center.
H. K. Gee.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-10273, $3.25 paper copy, $2.25 in microfiche. Quality of Coastal Waters, Project Bulletin No 9. Nov 1973. 3 p, 1 tab.

Descriptors: *Water quality standards, *Surface waters, *Hawaii, *Legislation, *Water quality control, Government, State governments, Governmental interrelations, Water pollution control, Water policy, Water law, Water resource development, Streams, Nitrates, Nutrients, Phosphates, Eutrophication, Water management(Applied), Conservation.
Identifiers: Federal Water Pollution Control Amendments of 1972.

One of the program objectives of the Hawaiian State Water Strategy for 1974 is to revise current water quality standards in order to eliminate certain inadequacies and to make them consistent with new federal guidelines. Proposed standards for maximum phosphorus and nitrogen levels in surface waters are unsuitable for fresh surface waters in Hawaii. The standards are based on Environmental Protection Agency guidelines, but are inappropriate for Hawaiian streams, generally because (1) they are exceeded in nature, and (2) the usual concern with high nutrient levels is unnecessary in Hawaii. No Hawaiian streams enter lakes, so there is no effect upon eutrophication, and Hawaiian streams are characteristically steep and fast flowing, thus there is no nuisance plant growth problem. Results of several studies illustrate how these standards are inappropriate. A special classification is suggested which would exempt from the EPA criteria those streams which exceed the proposed standards due to unique natural circumstances. (Deckert-Florida)

W74-13217

THIMBLE SHOAL CHANNEL (MAINTENANCE DREDGING) (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W74-13226

ENVIRONMENTAL LEAD: A SURVEY OF ITS POSSIBLE PHYSIOLOGICAL SIGNIFICANCE,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
H. V. Warren.
Journal of Biosocial Science, Vol 6, No 2, p 223-238, 1974. 4 tab, 49 ref.

Descriptors: *Lead, *Potable water, *Tosicity, *Soil, *Mercury, Metals, Environmental effects, Pollution, Human diseases, Rural areas, Water pollution effects, Water pollution sources.
Identifiers: *Neurological diseases, *Demyelination, Soil-lead.

Although multiple sclerosis, swayback, scrapie, kuru, Minamata disease, lead lameness (sheep), motor neurone disease, and amyotrophic lateral sclerosis are different illnesses, all, with the possible exception of scrapie, appear to have two common denominators: deterioration of the nervous system, which may or may not include demyelination, and a frequently unexplained association with lead or mercury. Sources of lead pollution, in drinking water, in food, and in air are discussed. While rural dwellers in areas of high soil-lead content are more apt to absorb the lead through food, city dwellers are more likely to inhale lead particles. Other sources of lead and mercury are described and evidence linking metallic elements with neurological diseases is postulated. (Prague-FIRL)
W74-13233

DRINKING WATER AS A SOURCE OF LEAD POLLUTION,
Glasgow Univ. (Scotland). Dept. of Materia Medica.
A. Goldberg.
Environmental Health Perspectives, Vol 7, p 103-105, May, 1974. 3 fig, 2 ref.

Descriptors: *Potable water, Lead, *Plumbing, *Toxicity, Path of pollutants, Public health, Water pollution effects.
Identifiers: *Glasgow(Scotland), *Soft water, Lead-lined drinking water tanks, *Lead poisoning, Metabolic effects.

Lead poisoning was found in some inhabitants of houses in rural Scotland, exposed to soft water and lead-lined drinking water tanks. Further investigations were carried out on the clinical and metabolic effects of lead acquired by drinking soft domestic water from lead plumbing systems in 23 Glasgow households. The lead content of water from cold taps was up to 18 times the upper acceptable limit and was proportional to the amount of lead in the plumbing system. The blood lead of 71 inhabitants of these houses showed a significant negative correlation with water-lead content. A small number of clinical abnormalities were found but could not be directly attributed to lead toxicity. The results of the study underline the possibility danger to health of lead plumbing systems in soft water regions.
W74-13234

RADIONUCLIDE UPTAKE BY SOME FRESH-WATER HYDROBIONTS, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
N.-R. F. Dushauskene-Duzh, E.-D. P. Marchyulenene, V. B. Nyanishkene, R. I. Shuliene, and G. G. Polikarpov.
Liet Tsr Moksiu Akad Darb Ser B. 3 p 201-212, 1972. English summary.
Identifiers: *Carp, Cerium, Cesium, Chironomus, Dreissen, Fish, Food, Hydrobionts, Larvae, Lead, Lymnaea, *Mollusks, Phytoplankton, Ruthenium, Strontium, *Absorption, *Radionuclides.

The accumulation coefficients of Sr90 and Pb210 were the same in fish and molluscs. The accumulation coefficients of Pb210 in plants appeared to be an order lower than those of Sr90. A correlative bond for fish was between the Sr90 and Pb210 concentrations. Sr90, Ce144, Cs137 and Ru106 accumulated in phytoplankton and silt with maximum coefficients. Among different radionuclides Ce144 exhibited the highest accumulation coefficient in hydrobionts. Chironomid larvae assimilated to following amounts of total available radionucleides from radioactive food: Sr90-10%, Cs137-9%, Ce144-11%, Ru106-6%. Yr old carp assimilated 10% of the total available Ce144 from chironomids passed through their gastrointestinal tracts. The uptake of Sr90, Ce144, Cs137 and Ru106 by dreissen and chironomid larvae, Sr90 uptake by Limnaea, Ce144 uptake by yr old carp occurred from the water in low quantities during feeding. In the natural environment fish of different trophic levels (carp and predatory) exhibited the same ability of Sr90 accumulation. The same was true for PB210. The accumulation coefficients of each radionuclide in the fish did not depend on their feeding type.--Copyright 1974, Biological Abstracts, Inc.
W74-13240

TEMPERATURE-TOXICITY MODEL FOR OIL REFINERY WASTE,
Utah Water Research Lab., Logan.
J. H. Reynolds, E. J. Middlebrooks, and D. B. Procella.
Journal of the Environmental Engineering Division, ASCE, Vol 100, No EE3, p 557-576, June, 1974. 3 fig, 12 tab, 54 ref.

Descriptors: *Mathematical studies, *Equations, *Temperature, *Microorganissms, *Toxicity, Testing, Phenols, Algae, Flow, *Model studies, Environmental effects, Reviews, *Oil wastes.

Equations have been developed using chemostat kinetics and enzyme inhibition kinetics to describe the effects of temperature on toxicity to microorganisms. These equations were tested by semi-continuous and continuous flow experiments with phenol and the alga Selenastrum capricornutum. The data obtained were fitted to competitive, uncompetitive, and noncompetitive inhibitor models. Results indicate that phenol exerts a competitive inhibition effect on the growth of the alga. Comparison of the competitive inhibition constants for S. capricornutum exposed to phenol indicates that phenol toxicity increases with an increase in temperature according to the Arrhenius function. (Sandoski-FIRL)
W74-13264

THE HAZARD OF IRON,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
F. J. Dart.
Water and Pollution Control, Vol 112, No 5, p 19-23, 33, 38, May, 1974. 2 tab, 4 ref.

Descriptors: *Iron, *Water treatment, On-site investigations, Analytical techniques, *Canada, Water pollution control, *Water pollution sources, Aquifers, Water pollution effects, Potable water.

In Ontario, Canada, the Ministry of the Environment has a drinking water objective of only 0.3 mg/liter or less of iron, a limit recommended not on the basis of possible toxicity but rather to avoid the many nuisance problems that arise with excess concentration. Without the proper identification of the sources of the problem iron, remedial measures can become an expensive problem. On the basis of Ministry field investigations, however, considerable progress is being made in identifying and remedying certain iron problem situations. Advances in silicate sequestering and the identification of the problem of interrelationships of iron, organic matter, and a multiple-aquifer water sources are examples of ongoing work. (Sandoski-FIRL)
W74-13269

STATIC LEACHING STUDIES ON PULPWOOD BARK RESIDUES,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
A. H. Benedict, J. J. McKeown, and R. D. Hart.
Journal of the Environmental Engineering Division, ASCE, Vol 100, No EE3, p 529-540, June, 1974. 8 fig, 3 tab, 2 ref.

Descriptors: *Leaching, *Laboratory tests, *Bark, Evaluation, *Water quality, Biochemical oxygen demand, Chemical oxygen demand, Color, Nitrogen, Phosphorus, Water pollution sources.
Identifiers: Bark residues, Bark leaching.

A laboratory study to define and evaluate the characteristics of bark leaching in terms of the types and quantities of materials leached from bark residues has been undertaken with the impact of these extractives on water quality being examined. The quantities of BOD5, COD, color, Kjeldahl nitrogen, and inorganic phosphorus leached from fresh and aged barks under static leaching conditions were determined. Results of these studies show that the quantity of BOD5, COD, color, nitrogen, and phosphores extracted from bark depends on the field storage age of bark and on the characteristics of the water in contact with the bark. The significance of each of these factors is examined subsequently. Based on the results of this study, the following conclusions can be made: potential of bark to leach these variables decreases with storage age in bark piles; under fresh water conditions variable concentrations will increase with increasing contact time, approaching limiting values; and, salt water retards BOD5, COD, color, and Kjeldahl nitrogen leaching from bark. (Sandoski-FIRL)
W74-13276

BIO-DEGRADATION OF NON-IONIC SURFACTANTS-II: BIODEGRADATION ASSESSMENTS (BIODEGRADAZIONE DI TENSIOATTIVINON IONICI. NOTA 2: MISURE DELLA BIODEGRADAZIONE),
Montecantini Edison, Novara (Italy). Instituto di Richerche G. Donegani.
P. Albanese, and R. Capuci.
La Rivista Italiana delle Sostanze Grasse, Vol 51, No 2, p 70-81, February, 1974. 3 fig, 9 tab, 23 ref.

Descriptors: *Biodegradation, *Surfactants, *Phenols, *Alcohols, Analytical techniques, Testing, Measurements, Pollutant identification, Water pollution sources.

Research was performed to determine whether the EMPA test could be used to assess biodegradation in non-ionic surfactants, polyethoxylated alkylphenols, and alcohols using different analytic procedures as appropriate. Standard-error values were discussed for the test and for concentration assessments obtained from surface tension measurements. (Sandoski-FIRL)
W74-13279

PROGRAM WILL CONTROL POLLUTION FROM WATERCRAFT,
Canada Centre for Inland Waters, Burlington (Ontario).
S. Beszedits, and A. Netzer.
Water and Pollution Control, Vol 112, No 6, p 33-34, 36, June, 1974.

Descriptors: *Boats, *Water pollution sources, Waste discharge, *Water pollution control, Treatment facilities, Equipment, Regulation, *Canada.

Pollution from watercraft is particularly acute and noticeable in Canadian inland waters around busy harbors, and in crowded marines. Although considerable efforts have been directed towards curbing such discharges, most vessels still continue to dump their wastes overboard without treatment. Lack of virgorous legislation and lax enforcement of existing regulations are primarily to blame for such conditions. On-board techniques for controlling pollutant discharges are discussed and manufacturers of marine pollution control equipment given. (Sandoski-FIRL)
W74-13295

THE ECONOMIC VALUE OF WATER FOR WASTE DILUTION: REGIONAL FORECASTS TO 1980,
Colorado State Univ., Fort Collins. Dept. of Economics.
S. L. Gray, and R. A. Young.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1653-1663, July, 1974. 5 tab, 12 ref.

Descriptors: *Forecasting, *Waste dilution, Water utilization, United States, Biochemical oxygen demand, *Economics, Estimating equations, Water resources, Optimization.

The procedures and findings of a recent study that developed forecasts of the value of water for diluting wastes in each of several major regions of the United States are presented. The discussion is limited to wastes in terms of biochemical oxygen demand loadings only. The conceptual issues in resource allocation, methods for estimating economic value and the chosen conceptual framework, sources of data, and forecasts of the regional values of dilution water for 1980 are examined. Finally, the conclusions emerging from the analysis are discussed. (Sandoski-FIRL)
W74-13297

THE BIODEGRADATION OF HYDROCARBONS,
U. Fasoli, and G. Genon.
La Chimica E L'Industria, Vol 56, No 3, p 191-195, March, 1974. 7 fig, 3 tab, 8 ref.

Descriptors: *Surface waters, *Self-purification, *Biodegradation, *Mathematical models, Model studies, Hydrocarbons, Numerical analysis, Application techniques.
Identifiers: Monod's equation.

Self-purification of surface water is dependent on the ability of its microorganisms to decompose organic substances, such as hydrocarbons or amines. Evaluation of time for the biodegradation and increase in the bacteria population is thus a priority. Two mathematical models, both based on Monod's growth equation, are presented for the interpretation of experimental results relating to hydrocarbon biodegradation. They differ with respect to their definition of the physical mechanism responsible for transfer of the hydrocarbon from the water to the bacterial mass. The numeric coefficients of the kinetic equations are determined following establishment of the formal structure of the two mechanisms. A comparison is also made between the two models and their possible applications. (Sandoski-FIRL)
W74-13300

INJECTING HIGHLY TREATED SEWAGE INTO A DEEP-SAND AQUIFER,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
S. D. Faust, and J. Vecchioli.
Journal of the American Water Works Association, Vol 66, No 6, p 371-377, June, 1974. 9 fig, 12 tab, 20 ref.

Descriptors: *Water quality, *Water demand, *Urbanization, *Aquifers, *Artificial recharge, Feasibility studies, Water reuse, Sewage disposal, Injection wells, *New York.

The growth in population in Nassau County, L.I., over the past twenty years has greatly increased the demand for water. At the same time, urbanization has reduced the recharge capacity of the local aquifer. In an effort to solve the problem, a series of artificial-recharge experiments are being carried out which examine the feasibility of injecting reclaimed water into a network of wells. The effect on the resultant water quality is discussed. (Sandoski-FIRL)
W74-13310

DEGRADATION OF ORGANIC NITROGENOUS COMPOUNDS BY PSYCHROPHILIC BACTERIA,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-13312

LIQUID SCINTILLATION COUNTING FOR PLUTONIUM IN ENVIRONMENTAL SAMPLES,
Dow Chemical Co., Golden, Col. Rocky Flats Div.
For primary bibliographic entry see Field 5A.
W74-13325

DESIGN, DRILLING AND COMPLETION, OPERATION, AND COST OF UNDERGROUND WASTE DISPOSAL WELLS IN GULF COAST REGION OF TEXAS AND LOUISIANA,
Pollution Control and Waste Disposal, Inc., New Orleans, La.
R. J. Meers.
Underground Waste Management and Artificial Recharge, Vol 1, p 337-345, 1973. 1 fig.

Descriptors: *Underground waste disposal, Effluents, Filtration, *Reservoirs, Exploration, Oil industry, *Groundwater, Disposal, Temperature, Data, Sands, Subsurface investigations, Drilling, Well design, Confined water, Corrosion, Casing, Cements, *Texas, *Louisiana.
Identifiers: Waste stream, *Waste disposal well, Sand parameters.

The first factor to be considered in determining the feasibility of underground waste disposal is the quality of the waste stream. Equally important is the necessity that the effluent by chemically stable, after filtration, under elevated temperature conditions of the injection zone. Once the suitability of the waste stream for underground waste disposal has been determined, the reservoir must be selected. Existing knowledge of the subsurface gained from oil and gas exploration provides enough data to determine a well depth sufficient to penetrate several probable reservoirs. Sand parameters measured in the disposal well permit selection of the most suitable reservoir. Geologic study of the subsurface provides information as to the areal extent and thickness of probable reservoirs. Well design must meet state requirements for protecting surface freshwater sands and confining the waste to the selected reservoir. Drilling and well-completing techniques, including casing and cement selection to meet corrosion-protection needs, should be planned to offer maximum protection against failure of any part of the waste system. (Campbell-NWWA)
W74-13340

SANITARY EVALUATION OF WATER QUALITY IN THE INITIAL OPERATING PHASE OF THE VYACHESLAV RESERVOIR, (IN RUSSIAN),
Meditsinskii Institut, Tselinograd (USSR).
N. I. Ananev, and N. A. Demin.
Gig Sanit, Vol 37, No 7, p 110-111, 1972.

Identifiers: Reservoirs, *USSR(Vyacheslav Reservoir), *Biochemical oxygen demand, Water quality, Sanitary conditions.

Investigations of the water quality changes occurring during the initial phase of operation of the Vyacheslav reservoir (USSR) showed both increased coloration and biological O2 demand during the initial periods due to insufficient cleaning of the bed, and to filling of the reservoir to a fraction of the total capacity.--Copyright 1974, Biological Abstracts, Inc.
W74-13364

HYGIENIC STANDARDIZATION OF THE COMPONENTS OF RUBBER PRODUCTION SEWAGE IN RESERVOIR WATER, (IN RUSSIAN),
Permskii Politekhnicheskii Institut (USSR).
For primary bibliographic entry see Field 5C.
W74-13373

ON THE BEHAVIOR OF OIL PRODUCTS IN SURFACE DEPOSITS AND GROUND WATER, (IN FINNISH),
Geological Survey of Finland, Otaniemi.
P. Lahermo.
Geologi(Helsinki), 8, p 105-110, 1972, Illus. English summary.
Identifiers: Degradation, *Oil pollution, *Groundwater, *Path of pollutants.

With the increase in consumption of oil products, there is considerable risk of oil seeping into ground water. The rate of infiltration into surface deposits depends upon grain size and moisture content of soil, as well as the structure of the beds and the refining grade of the different oils. Detrimental effects depend on how long the oil remains in deposits, as well as on its solubility in water. Light oils are often less harmful than heavy ones which tend to move in soil with difficulty, but do not disintegrate easily. On the ground surface, oils disappear quickly as a result of oxidation and bacterial activity, whereas in anaerobic conditions disintegration is slow. The ground waters in Finland are easily polluted, as the water table is near the surface and the thickness of aquifers is small. To prevent ground waters from becoming polluted by oil, the most important areas of its formation should be protected. The present water law is a step toward pollution control.--Copyright 1973, Biological Abstracts, Inc.
W74-13379

SOME HYDROBIOLOGICAL PROBLEMS OF THE GROUNDWATER ENRICHMENT AT THE BUDAPEST METROPOLITAN WATERWORKS,
Lajos Kossuth Univ., Debrecen (Hungary). Zoological Inst.
For primary bibliographic entry see Field 5C.
W74-13383

DATA ON THE HYDROBIOLOGICAL STATUS OF THE BODROG RIVER BACKWATER AT SAROSPATAK: II. HYDROCHEMISTRY,
Wasser-Kanals. Kamitats Hajdu-Bihar, Debrecen (Hungary).
For primary bibliographic entry see Field 2K.
W74-13385

WATER POLLUTION ASPECTS OF STREET CONTAMINANTS,
Illinois State Univ., Normal. Coll. of Applied Science and Technology.
A. R. Jacobson.
Public Works, Vol 105, No 7, p 84, July, 1974.

Descriptors: *Roads, *Paving, *Cleaning, Water pollution sources, Operation and maintenance, Investigations, Personnel, Training.

Pollutant characteristics of street surface contaminants have been investigated with the following recommendations being made based on the findings. Equipment operators should be trained in how to operate their quipment most efficiently and in knowing what material needs to be removed and where it is most commonly located. Increased effort should be expended on street cleaning operations, in maintaining records, in maintaining pavements, and in the selection of material for paving purposes. Other guidelines for the operation and maintenance of streets are indicated and research areas for future investigation are presented. (Sandoski-FIRL)
W74-13411

ANNUAL ENVIRONMENTAL MONITORING REPORT: CALENDAR YEAR 1973,
Mound Lab., Miamisburg, Ohio.
D. G. Carfagno, and W. H. Westendorf.
Available NTIS, Springfield, Va 22161 as Rept. No. MLM-2142; $3.25/copy, $2.25/microfiche. Report No MLM-2142, April 25, 1974. 37 p, 3 fig, 15 tab, 4 ref, append.

Descriptors: *Monitoring, Environment, *Radioactivity, *Sampling, *Analytical techniques, Laboratories, Air, Water, Soils, Foods, Silts, Tritium, Polonium, Plutonium, Assay, Public health, *Ohio.
Identifiers: *Mound Laboratory(Ohio).

The environment surrounding Mound Laboratory was monitored and the results are reported for calendar year 1973. Samples analyzed included air, water, foodstuffs, soil, and silt. For radioactive species, the average concentrations of poloniun-210, plutonium-238, and tritium detected were well within the stringent standards adopted by the Atomic Energy Commission and the Environmental Protection Agency. Data concerning non-radioactive species in air and water were also presented. Water monitoring for radioactive species showed the average concentrations of plutonium-238 and tritium measured at the water sampling locations during this period to be less that 0.1% and 0.5% of the respective RCG values. Additionally, data concerning radioactive species in surface water, community drinking water, foodstuffs, and silt are presented. The results of the analyses for the year 1973 are provided. (Houser-ORNL)
W74-13429

ENVIRONMENTAL AND RADIOLOGICAL MONITORING AT THE NATIONAL REACTOR TESTING STATION DURING FY-1973 (JULY 1972-JUNE 1973),
Idaho Operations Office (AEC), Idaho Falls. Health Services Lab.
For primary bibliographic entry see Field 5A.
W74-13431

ENVIRONMENTAL LEVELS OF RADIOACTIVITY AT ATOMIC ENERGY COMMISSION INSTALLATIONS.
Division of Operational Safety (AEC), Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-13432

TRITIUM IN PRECIPITATION AND FRESHWATER SOURCES IN ISRAEL,
Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
I. Carmi, and J. R. Gat.
Isr J Earth Sci. Vol 22, No 2, p 71-92. 1973 Illus.

Descriptors: *Groundwater, Water sources, Water pollution, Pollutants, *Water pollution sources, Precipitation(Atmospheric), *Tritium, Radioisotopes, Rivers, Europe, Freshwater, Springs, Karst.
Identifiers: *Israel(Jordan River).

Tritium levels in groundwater sources in Israel are generally very low. Exceptions were found in some karst springs and ina basaltic fractured aquifer. An age analysis of the Jordan River sources showed the presence of a seasonal component with water ages of less than 5 yr and a base flow whose tritium ages were in excess of 10 yr. The tritium record in the precipitation from 1958-1971 is also presented.--Copyright 1974, Biological Abstracts, Inc.
W74-13444

SLOW-RELEASE PESTICIDE SYSTEM: POLYMERS OF LACTIC AND GLYCOLIC ACIDS AS ECOLOGICALLY BENEFICIAL, COST-EFFECTIVE ENCAPSULATING MATERIALS,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5G.
W74-13445

MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA, PART II. BIOLOGICAL INVESTIGATIONS.
Allan Hancock Foundation, University of Southern California: Los Angeles, Calif., 1973, 237p. D. F. Soule and M. Oguri Editors.

Descriptors: *California, Bays, Harbors, *Ecosystems, Wastes, Pollutants, *Industrial wastes, *Water pollution sources, Fish populations, Demersal fish, Fish, Effluents, Liquid wastes, Benthos, Cannaries.
Identifiers: Amino-acids, Engraulis-mordax, *San Pedro Bay(Calif), Anchovy.

This volume concerns biological investigations of San Pedro Bay, California,. After an introductory section discussing such specifics as area description, circulation patterns and productivity, free amino acid variation in the anchovy, Engraulis mordax from the Los Angeles Harbor, is discussed. The roles of microbial activity in the harbor ecosystem are then discussed, followed by coverage devoted to a working report on the dilution of cannery wastes discharged into the Los Angeles Harbor. An annotated bibliography on cannery effluents is included, followed by discussion on the results of 14 benthic trawls conducted in the outer Los Angeles-Long Beach Harbor, California, on May 24, 1972. Coverage of the demersal fish populations of San Pedro Bay is given, followed by an annotated bibliography on the northern anchovy, E. mordax and a discussion on the numerical analysis of a benthic transect in the vicinity of waste discharges in outer Los Angeles Harbor. Numerous illustrations are included throughout and each contribution ends with a list of literature cited.--Copyright 1974, Biological Abstracts, Inc.
W74-13461

OBSERVATIONS ON THE HYDROLOGY AND MARINE ORGANISMS OF THE TIDAL COLORADO RIVER AND ADJACENT WATERS, TEXAS, FEBRUARY-JUNE 1962,
National Marine Fisheries Service, Galveston, Tex. Biological Lab.
R. A. Diener.
Contrib Mar Sci. 17, p 99-110, 1973. Illus.

Descriptors: *Texas, Rivers, *Colorado River, *Salinity, Temperature, Aquatic life, Marine animals, Crustaceans, Crabs, Marine fish, Shrimp, Trout, Fish.
Identifiers: Callinectes-sapidus, Ctenophores, Cynoscion-arenarius, Leiostomus-xanthurus, Micropogon-undulatus, Penaeus-aztecus, Croaker, Seatrout.

Salinity and temperature measurements and collections of organisms at 2-wk intervals began in Feb., 1962 and continued through June, 1962 at 10 stations in the tidal Colorado River of Texas and adjacent waters. Surface salinity ranged from 1.0 degrees/00-31.2 degrees/00 and bottom salinity ranged from 10.6 degrees/00-31.2 degrees/00. Surface salinity fluctuated the most in the Colorado River, increasing with flood tide and decreasing with ebb tide while the least fluctuation occurred in East Matagorda Bay, reflecting the reduced influence of tides and high evaporation-precipitation ratio. Surface and bottom salinity differences were the greatest (28.5 degrees/00) in the river and the Gulf Intracoastal Waterway where mixing was slight and the least (8.4 degrees/00) in the bays where mixing was the greatest. Water temperatures (surface and bottom) paralleled the general warming trend of air temperature. Temperatures of bottom waters during February and early March were warmer than those of surface waters, but the situation reversed itself during the remainder of the study. Invertebrates (18 spp.) and vertebrates (39 spp.) were collected. Ctenophores, brown shrimp (Penaeus aztecus) and blue crabs (Callinectes sapidus) were the most abundant invertebrates while the Atlantic croaker (Micropogon undulatus), spot (Leiostomus xznthurus) and sand seatrout (Cynoscion arenarius) were the most abundant vertebrates. Nearly all of the abundant species displayed numerous peaks within the study area during May or June with a corresponding increase of size as the season advanced from Feb.-June.--Copyright 1974, Biological Abstracts, Inc.
W74-13463

GALVESTON BAY BENTHIC COMMUNITY STRUCTURE AS AN INDICATOR OF WATER QUALITY,
Texas Univ., Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5A.
W74-13464

BREEDING CALANOIDA AND CYCLOPOIDA (COPEPODA, CRUSTACEA) IN THE WATERS OF THE GUAMA, CAPIM AND TOCANTINS REGIONS, WITH A NOTE ON THE ACCOMPANYING FAUNA, (IN PORTUGESE),
Instituto de Pesca, Parque Fernando Costa, Sao Paulo (Brazil).
For primary bibliographic entry see Field 5C.
W74-13465

DISTRIBUTION OF THE FIDDLER CRABS, UCA PUGNAX AND UCA MINAX, IN RELATION TO SALINITY IN DELAWARE RIVERS,
Millersville State Coll., Pa. Dept. of Zoology.
K. G. Miller, and D. Maurer.
Chesapeake Sci. Vol 14, No 3, p 219-221, 1973.

Descriptors: Rivers, *Delaware, *Crabs, *Salinity, Crustaceans, Saline water, Water pollution sources, Fishing.
Identifiers: *Fiddler crabs, Uca-minax, Uca-pugnax.

The distribution and abundance of the fiddler crabs, Uca pugnax and U. minax were determined in relation to salinity in 3 tidal tributaries of Delaware Bay. Only Uca pugnax was present in high salinity (21-29 0/00) while U. minax was present in lower salinities and even in fresh water. Their distributions overlapped along the salinity gradient and both species were equally abundant in salinities of 8-12 0/00. There was a statistically significant positive association between abundance and salinity for Uca pugnax and a negative association for U. minax.--Copyright 1974, Biological Abstracts, Inc.
W74-13468

AN ECOLOGICAL SURVEY OF THE ALGAE OF HUNTINGTON CANYON, UTAH,
Brigham Young Univ., Provo, Utah. Dept. of Botany and Range Science.
For primary bibliographic entry see Field 5C.
W74-13469

MERCURY CONTENT OF THE MUSSELS (MYTILUS EDULIS) GROWING FREE AND UNDER CULTIVATION IN NORTHWEST SPAIN, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Cadiz (Spain). Laboratorio de Investigaciones Pesqueras.
R. Establier.
Invest Pesq, Vol 37, No 1, p 101-106, 1973, Illus. English summary.

Descriptors: *Mercury, *Mussels, Water pollution sources, Pollutant identification.
Identifiers: Mytilus edulis, *Spain.

Fourteen samples of natural populations and 10 of populations under culture were analyzed. The samples were obtained in different places of the Rias of NW Spain: Vigo, Pontevedra, Arosa, Muyos and Noya. In cultivated mussels, the Hg content in ppm wet weight ranges between 0.06 and 0.14, with the exception of 2 samples from Marin with a content of 0.24-0.28 ppm. These values are below the allowed levels accepted by different countries. Mussels growing in natural habitats show a higher Hg content, perhaps because of their slower growth.--Copyright 1974, Biological Abstracts, Inc.
W74-13493

5C. Effects Of Pollution

DREDGING PROBLEMS AND COMPLICATIONS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
L. S. Slotta.
In: Coastal Zone Management Problems, seminar conducted by Water Resources Research Institute, Oregon State University, Fall 1973, Corvallis. Report SEMN WR 018-74, January 1974, p 39-52. 2 tab, 31 ref.

Descriptors: *Dredging, *Estuarine environment, *Environmental effects, Disposal.
Identifiers: *Dredge spoils.

In the U.S., maintenance dredging and new dredging projects cost over $150 million in 1972 and accounted for the transfer of over 300 million cubic yards and 80 million cubic yards of dredge spoils, respectively. Environmental concerns in relation to dredging have risen due to the relatively fragile nature of estuarine ecosystems and the widespread use of dredging in estuaries. Particular interest has been generated around the two common practices of spoil disposal by either filling marsh lands or dumping in estuarine waters. During a 15 month period, an interdisciplinary team at Oregon State University has conducted research on the environmental impact of estuarine dredging. Results from the study indicate a number of acute environmental impacts including altered circulation, physical removal of organisms, burial of organisms, turbidity, and suspended solids, nutrient release, increased oxygen demand, and released free sulfides, heavy metals and toxic hydrocarbons. Chronic impacts resulting from dredging include particle size change, evolution of resistance biological communities, and increased or decreased sediment turnover. EPA guidelines and potential research requirements for dredging are also discussed. (See also W74-12756) (Schroeder-Wisconsin)
W74-12761

FISH POISONING IN THE EASTERN CARIBBEAN,
Caribbean Research Inst., St. Thomas, Virgin Islands.
R. W. Brody.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 100-116. 2 fig, 1 tab, 16 ref.

Descriptors: *Fish toxins, *Poisons, Bacteria, Degradation(Decomposition), Epidemology, Shellfish, Marine fisheries, Commercial fishing, Toxicity, Systematics.
Identifiers: *Virgin Islands, *Leeward Islands, *Caribbean, Endotoxins, Clupeiotoxism, Scrombroid poisoning, Ciguatera poisoning, Biogenesis, Symptomology.

There is very little data on the chemistry, biology, and pharmacology of fish poisoning in the eastern Caribbean. Fish poisoning is reported from all islands of the northern Virgin and Leeward Island groups. Puerto Rico, Hispaniola and St. Croix have a much lower incidence rate than the Windward Islands (Trinidad to Martinique). The problem can be broken down into three major groupings. The endotoxins from the puffer-like fishes with the additional rarely reported cases of clupeoid, elasmobranch and hallucinogenic fish poisoning in the first group. The second major group of poisonings in the area is the result of bacterial decomposition of fresh fish. The third general type is described as ciguatera fish poisoning. Evidence from the Pacific suggests that there are at least three (probably more) distinct toxins capable of producing the ciguatera syndrome. Scombroid and ciguatera poisoning are considered to be most detrimental to the fishing industry. Because scombroid poisoning can be prevented by modern fish preservation techniques and treatment is specific and effective, it is considered a less severe problem than ciguatera poisoning. Development of commercial fisheries in the eastern Caribbean is severely impeded by the prevalence of ciguatoxin in commercially desirable species. (Jones-Wisconsin)
W74-12772

MORTALITY FROM CANCER AND CARDIOVASCULAR DISEASES IN THE COUNTY BOROUGHS OF ENGLAND AND WALES CLASSIFIED ACCORDING TO THE SOURCES AND HARDNESS OF THEIR WATER SUPPLIES, 1958-1967,
Stocks (Percy) Colwyn Bay (Wales).
P. Stocks.
J Hyg. Vol 71, No 2, p 237-252. 1973.

Descriptors: *Water quality, *Human diseases, Artesian wells, Wells, Water wells, Rivers, Hardness(Water), Mortality.
Identifiers: *Cancer, England, *United Kingdom(Wales), Stomach, Esophagus, Prostate, Bladder(Male), Breast(Female), Hypertension, Rheumatic heart disease.

Relative rates of proportionate mortality from cancer of 6 sites based on total cancer deaths and the proportions expected in all towns and from 4 types of cardiovascular disease based on total deaths from all causes, were related in the 80 county boroughs of England and Wales to the sources of water supply and to the average hardness of water in the towns. The sources of water, from upland surfaces, artesian wells and rivers, were classified in 8 groups and significant associations were found for cancers of the stomach, esophagus, prostate, male bladder and female breast and for hypertensive and chronic rheumatic heart disease. No associations were apparent with intestinal cancer, vascular disease of the nervous system or arteriosclerotic heart disease. Hardness or softness of the water was classified in 7 groups and significant associations were found for the same diseases as for source of water, none being evident for coronary disease.--Copyright 1974, Biological Abstracts, Inc.
W74-12818

BUILD-UP OF MINERAL CONTENT IN LAKE DARDANELLE AND THE EFFECT OF ZOOPLANKTON,
Arkansas Polytechnic Univ., Russellville. Dept. of Biological Science.
T. N. Palco.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 283, $7.00 in paper copy, $2.25 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Publication No 24, 1974. 186 p, 57 fig, 48 tab, 38 ref. OWRT A-015-ARK(1).

Descriptors: *Arkansas, Nutrients, Water pollution effects, Poultry, Effluents, *Zooplankton, Rotifers, Nitrates, Phosphates, Chlorides, Oxygen, Temperature, Carbon dioxide, *Eutrophication, Productivity, Streams, Hydrogen ion concentration, Water chemistry, Reservoirs, Waste disposal, Water spreading, Mineralogy.
Identifiers: *Poultry effluents, *Lake Dardanelle(Ark), Uric acid, Land spreading.

The effects of poultry effluents on water quality of Lake Dardanelle and its feeder streams in West Central Arkansas were studied during three sampling periods in 1970, 1971, and 1972. To determine these effects the following factors were investigated: (1) physicochemical analysis; (2) zooplankton community identification; and (3) limited phytoplankton studies by the qualitative-quantitative assessment of chlorophylls. Feeder streams of the Lake Dardanelle Reservoir are major contributors of soluble nutrients which are available to primary producers. Their heavy load of poultry effluents is the result of large poultry operations consisting of both chicken houses and turkey ranges which are located in the watershed of these streams. The addition and the retention of these nutrients in the lake are greatly affected by the magnitude of the flow of feeder streams into the lake. The most influential stream is the Illinois Bayou, owing to its size and consistency of flow. Land spreading is the method of disposal of litter from poultry houses. The magnitude of these soluble nutrients in the streams is dependent on several factors. These include (1) soil conditions at the time of spreading of litter; and (2) the period of time for integration into the soil after spreading before the occurrence of the next rainfall in the area which has the capacity of carrying or leaching this material into the stream bed.
W74-12859

ANALYSIS OF NUTRIENT SUPPLIES FOR ALGAE IN ELEPHANT BUTTE RESERVOIR,
New Mexico Univ., Albuquerque. Dept. of Biology.
G. V. Johnson, D. E. Kidd, and J. D. Garcia.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 282, $4.25 in paper copy, $2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No 037, April 1974. 73 p, 10 fig, 10 tab, 14 ref. OWRT A-040-NMEX(3).

Descriptors: *Aquatic algae, *Nutrient requirements, *Chlorophyta, *New Mexico, Reservoirs, Eutrophication, Biomass, *Nitrates, *Phosphates, Orthophosphates, *Chlamydomonas, Enzymes, Rio Grande River, Bioassay, Primary productivity, Phytoplankton.
Identifiers: *Elephant Butte Reservoir(N Mex), Artificial substrates, Scenedesmus dimorphus, Anabaena flos-aquae, Chlamydomonas debaryana var cristata, *Platymones sp.

Nutrient supplies for algae in Elephant Butte Reservoir were investigated by chemical analysis of water samples, laboratory bioassays with unialgal cultures, and field experiments in which the effect of nutrient additions on primary productivity of the natural phytoplankton population was determined. The average nitrate concentration was 0.59 mg/liter as nitrogen. The average total phosphate and orthophosphate concentrations were 0.395 and 0.090 mg/liter as phosphorus in the lower Reservoir and 0.642 and 0.176 mg/liter as phosphorus in the upper Reservoir. Nitrogen was a limiting nutrient for algal growth in all laboratory bioassays of Reservoir water conducted with green algae. Phosphorus was also limiting in most bioas-

says of Reservoir water conducted in the laboratory. Growth of algae colonizing artificial substrates suspended in the Reservoir was correlated with the nitrate concentration of Reservoir water. The nitrogen content of the algal material varied and was not correlated with the nitrate concentration of Reservoir water. These observations suggest that nitrogen was limiting accumulation of algal biomass on the artificial substrates. Cultures of two predominate species of green algae occurring in the Reservoir, Chlamydomonas sp. and Platymonas sp., were found to produce acid and alkaline phosphatases when grown with growth limiting orthophosphate concentrations. Growth of algae in nutrient solutions with varying nitrate concentrations in the laboratory indicated that the nitrate levels in Reservoir water would severely limit growth if other nutrients were present at the levels supplied in the bioassays. (Hain-New Mexico State)
W74-12861

COMPONENT DESCRIPTION OF SEDIMENT-WATER MICROCOSMS,
Utah State Univ., Logan. Center for Water Resources Research.
J. Hill, IV, and D. B. Porcella.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 293, $3.75 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory, Publication PRWG121-2, Utah State University, Logan, June 1974. 45 p, 15 fig, 16 tab, 12 ref. OWRT B-081-UTAH(1). 14-31-0001-3942.

Descriptors: *Computer models, Microenvironment, Nutrients, Sediments, Dissolved oxygen, Flow, Eutrophication, Systems analysis, *Model studies, *Sediment water interfaces, Ecosystems, Mercury, Aerobic conditions, Anaerobic conditions.
Identifiers: *Component analysis.

The development and application of complementary variables (potential and flux) for modeling environmental systems are illustrated for the hydraulic and dissolved oxygen subsystems of laboratory microcosms. These sediment-water, semi-continuous flow microcosms were used to determine nutrient interchange and mercury interactions under lighted (aerobic) and dark (anaerobic) conditions. The approach of using complementary variables to describe such systems forces a more complete conceptual understanding of the system and better attention to those parameters (many of which are unknown) requiring measurement. Complementary variables are incorporated into basic linear component equations which describe basic processes of energy transfer and transformation. The components are interconnected through the use of bond graphs and reduced through topographic and matrix techniques to state space system equations. A transfer function is determined from the state equations and from time domain analysis of the system output. These two expressions of the transfer functions are used to determine component values. Observed and predicted hydraulic flow and dissolved oxygen values agreed fairly closely. Reasons for deviation in predicted oxygen levels are discussed. Estimates of capacitance (stored potential energy) inertance (stored kinetic energy), and resistance were obtained from data analysis for each particular subreaction where judged important in the conceptualization of the particular system of interest.
W74-12868

DEER AND RABBIT RESPONSE TO THE SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT ON WILD LAND,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W74-12887

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED BYRON STATION UNITS 1 AND 2, COMMONWEALTH EDISON COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
Available from NTIS, Springfield, Va. 22161, as Docket No. 50454-47; $8.75/copy, $2.25/microfiche. Docket Nos STN-50-454 and STN-50-455, July 1974. 297 p, 34 fig, 51 tab, 174 ref.

Descriptors: *Nuclear powerplants, Effluents, Environment, Administrative agencies, Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Illinois.
Identifiers: *Pressurized water reactors, *Rock River(Ill), *Environmental Impact Statements.

The site for the proposed Byron Station, Units 1 and 2 is near Rock River in Rockvale Township, Ogle County, Illinois. The station will employ two pressurized water reactors cooled by closed-cycle cooling using two natural-draft cooling towers. Makeup water will be drawn from and discharged to the Rock River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to issue construction permits subject to the following: (1) Avoid any unnecessary adverse environmental impacts during constructions; (2) monitoring as specified; (3) review construction activities periodically for conformity; (4) provide written notification of any significant adverse impacts unforeseen; (5) provide analysis and plan of action to correct adverse impacts observed during construction. (Houser-ORNL)
W74-12902

FINAL ELK RIVER REACTOR SITE SURVEY, RESULTS AND SUMMARY - JULY 23, 1974.
United Power Association, Elk River, Minn.
For primary bibliographic entry see Field 5B.
W74-12903

ECOLOGY OF TOXIC METALS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-12908

PROTEIN RECOVERED FROM INDUSTRIAL WASTE WATER AS FEED FOR CHICKS,
Norges Landbrukshoegskole, Vollebekk. Dept. of Poultry and Fur Animal Science.
For primary bibliographic entry see Field 5B.
W74-12933

THE EFFECT OF SELECTED DYES IN THE ENVIRONMENT,
Crompton and Knowles Corp., Reading, Pa. Dyes and Chemicals Div.
R. H. Horning.
Tappi, Vol 57, No 3, p 135-137, March 1974. 1 fig, 6 tab, 3 ref.

Descriptors: *Dyes, *Dye concentrations, *Dye releases, *Water pollution effects, *Fish, *Toxicity, Effluents, Organic compounds, Color, Oxygen consumption, Water pollution sources, Industrial wastes, Chemical wastes, Anaerobic conditions, Minnows.
Identifiers: Fathead minnows.

Several studies concerning the polluting effects of dyes in paper and textile mill discharges are summarized. One investigation, which provided the average metal contents of 900 acid, basic, and direct dyes, indicated that the contribution of nonmetallic dyestuffs to the metal content of typical effluents is of the order of parts per billion. Another study led to an improved method for measuring effluent color values independent of their hue. The remaining examinations covered 29 acid, basic, and direct dyes representative of nearly all important dye classes. In their effects on fathead minnows, 11 dyes showed 96-hour TL-50 concentrations below 100 mg/liter, while Warburg respirometer tests indicated oxygen uptakes for 9 dyes that were at least 10% less than for high-concentration controls. Several dyes tested at 1-5 mg/liter of organic carbon provided results within 5% of the control. Only 3 dyes showed a significant effect on being added to an anaerobic system, with digester failure occurring only in one case. It is concluded that dyes used with proper care are not likely to pose serious ecological hazards. (Witt-IPC)
W74-12950

THE DISPOSAL OF WASTE IN THE OCEAN,
Southern California Coastal Water Research Project, Los Angeles.
For primary bibliographic entry see Field 5E.
W74-12956

PRODUCTION AND RELEASE OF RADIOACTIVE KRYPTON- AND XENON-ISOTOPES BY NUCLEAR POWER PLANTS AND REPROCESSING PLANTS AND THE EXPECTED RADIOLOGICAL BURDEN TILL THE YEAR 2000, (ERZEUGUNG UND FREISETZUNG VON RADIOAKTIVEN KRYPTON- UND XENON-ISOTOPEN DURCH KERNREAKTOREN UND WIEDERAUFARBEITUNG SANLAGEN UND DIE VORAUSSICHTLICHE RADIOLOGISCHE BELASTUNG BIS ZUM JAHR 2000),
Kernfurschungszantrum, Karlsruhe (West Germany).
For primary bibliographic entry see Field 5A.
W74-12971

LEAD IN THE CALIFORNIA SEA LION (ZALOPHUS CALIFORNIANUS),
Ohio State Univ., Columbus. Environmental Biology Program.
H. W. Braham.
Environ Pollut Vol 5, No 4 p 253-258, 1973.

Descriptors: *Lead, *Pollutant identification, *Water pollution effects, Heavy metals, Metals, Spectrophotometry, Analytical techniques, Bioassay.
Identifiers: California, *Sea lions, Zalophus-Californianus, Seals(Animal).

Atomic absorption spectrophotometric analysis was conducted on tissue samples taken from 19 organs in the California sea lion, Z. californianus, to determine the distribution and concentration of the heavy metal Pb. Pb was accumulated in significantly higher concentrations in hard tissue, bone and teeth, than in soft tissue such as fat and muscle. These results are comparable with those found in man, suggesting that exposure levels of Pb may be similar for terrestrial and coastal environmental communities.--Copyright 1974, Biological Abstracts, Inc.
W74-12973

ACUTE AND CHRONIC TOXICITY, UPTAKE AND RETENTION OF CADMIUM IN FRESHWATER ORGANISMS,
Freshwater Fisheries Research Lab., Tokyo (Japan).
H. Kumada, S. Kimura, M. Yokote, and Y. Matida.

Bull Freshwater Fish Res Lab Tokyo. Vol 22, No 2, p 157-165. 1972.

Descriptors: *Aquatic life, Aquatic animals, *Freshwater fish, *Cadmium, *Water pollution, Water, *Toxicity, Pollutants, Fish, Trout, Rainbow trout, Growth, Reproduction, Lethal limit.
Identifiers: Dace, Triborodon-hakonensis, Japan.

The ratio of 96 or 240 h TLm (medium tolerance limit) of Cd to a concentration which cuases little or no inhibition of fish (rainbow, trout, dace, Triborodon hakonensis) growth in 30 wk was less than 10. Long term exposure of fish and aquatic organisms to Cd increases the element content. The accumulation rate of Cd was apparently different by species. The present permissible concentration of Cd in potable water can not be considered safe enough to propagate rainbow trout normally. Further studies should be made in the relationship between the chemical forms of Cd compounds accumulated in fish and their toxicity, to establish the safety levels for man of Cd contents in aquatic organisms and water.--Copyright 1974, Biological Abstracts, Inc.
W74-13027

STUDIES ON THE CRUSTACEAN PLANKTON OF A FRESHWATER TANK AT PILANI, RAJASTHAN, (IN MALAYALAM)
Christ Coll., Irinjalakuda, (India).
C. K. G. Nayar.
J Kerala Acad Biol. Vol 3, No 2, p 12-19, 1972. Illus. English summary.

Descriptors: Crustaceans, *Copepods, Aquatic animals, Plankton, *Zooplankton, Storage tanks, Water pollution, Water temperature, Animal growth, *Environmental effects, *Reproduction, Analysis.
Identifiers: *Cladocers, *India.

Fortnightly collections of plankton were taken for a period of 20 mo. from a concrete tank at Pilani, Rajasthan, India. Collections were made with the help of a specially prepared tow net; quantitative estimations were made after Green and Nayer. Physico-chemical factors such as temperature, pH, dissolved O2, alkalinities due to carbonate and bicarbonate were also determined at the time of each collection. No well defined seasonal periodicity was shown for the total zooplankton in the Pilani tank. Among the zooplankton, the Crustacea contributed more than 65% except during January-February 1963, and January-March 1964. Crustacean percentage was higher during summer months when the water is relatively warm. The Copepoda and Cladocer show a somewhat similar pattern of seasonal distribution. As with the Cladocera, increase in water temperature may be an important factor in inducing the growth and reproduction of the Copepoda.--Copyright 1974, Biological Abstracts, Inc.
W74-13031

SHELLFISH CULTURE USING THE HEATED EFFLUENT FROM ELECTRIC POWER PLANTS,
Connecticut Univ., Storrs. Inst. of Water Resources.
S. Y. Feng, and G. S. Campbell.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 409 $3.25 in paper copy, $2.25 in microfiche. Completion Report, 1974. 5 p, 4 ref. OWRT A-040-CONN(1), 14-31-0001-3807.

Descriptors: *Shellfish farming, *Aquiculture, *Oysters, *Thermal power plants, Effluents, *Heated water, *Growth rates, Water pollution effects, Temperature, Proteins, Carbohydrates.
Identifiers: Prolonged exposure, Condition index, Shell disposition, Gonadal development.

Yearling oysters (Grassostrea virginica) suspended in trays in the heated effluent and also near the intake to a power plant (controls) were sampled monthly for 17 months and their protein and carbohydrate content, condition index and extent of gonadal development determined. The oysters in the heated effluent consistently showed higher levels of portein (56%), carbohydrate (109%) and condition index (22%) than the control oysters during the winter and spring months. The rapid growth of oysters in the discharge canal during this period appeared to be associated with optimum temperatures (14-19 C) and the presence of a very large spring phytoplankton bloom, which due to the low ambient temperatures (2-7 C) in the intake canal, was not available to the control oysters for use. During the summer months, the control oysters attained levels of protein, carbohydrate and condition index that were similar to those of the warm-water grown oysters. The development of the gonads of the oysters in the heated effluent occurred four months earlier than in the controls, but spawning took place only one month earlier. The warm-water grown oysters produced thicker shells that the control oysters. (deLara-Connecticut)
W74-13045

CONTAMINATION OF CHANNEL CATFISH WITH DIELDRIN FROM AGRICULTURAL RUNOFF,
Iowa Cooperative Fisheries Research Unit, Ames.
R. V. Bulkley, L. R. Shannon, and R. L. Kellogg.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 416 $5.75 in paper copy, $2.25 in microfiche. Completion Report, Iowa Water Resources Research Institute, Ames, No 62, (ISWRRI-62), June 30, 1974. 144 p, 29 fig, 43 tab, 105 ref, append. OWRT A-042-IA(1), 14-31-0001-3515/3815/4015.

Descriptors: *Dieldrin, *Channel catfish, Water pollution, Agricultural pesticides, Path of pollutants, Pesticides, Absorption, Chlorinated hydrocarbon pesticides, Runoff, *Iowa, Corn(Field).
Identifiers: Dieldrin accumulation, Retention, Excretion, *Des Moines River(Ia).

Dieldrin concentrations in Des Moines River water measured from April to October ranged from 1 to 50 ng/liter during 1971-1973. Peak concentrations in river water usually followed within a month after corn planting season. Dieldrin levels in aquatic insects and minnows sampled in 1973 were highest in June, decreased in the summer and increased to higher levels in autumn. Dieldrin levels in catfish muscle varied significantly with size and age of fish but not with amount of muscle fat. Annual and seasonal trends in dieldrin levels in catfish muscle were not consistent for different length groups except that peak levels most frequently occurred in July each year. Biomagnification of dieldrin from catfish food organisms to catfish muscle was not evident. Twenty-eight day exposure to 75 ng/liter dieldrin in water resulted in 14-16 in. catfish accumulating more dieldrin in muscle than did 6-9 in. fish. After elimination for 28 days, dieldrin levels in both size groups were nearly equal. When fish were exposed in both food and water, dieldrin from both sources contributed to the total muscle concentration. Large catfish accumulated more dieldrin from food and water than did small catfish but eliminated dieldrin at a similar rate after exposure ceased.
W74-13050

EFFECTS OF OFFAL DISPOSAL FROM ANIMAL PROCESSING PLANTS ON WATER QUALITY AND AQUATIC LIFE OF NATURAL STREAMS,
Mississippi State Univ., State College. Dept. of Wildlife and Fisheries.
D. E. Wesley, D. Williams, and B. M. Teels.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 420, $3.75 paper copy, $2.25 in microfiche. Mississippi Water Resource Research Institute, Mississippi State, Completion Report, July 1974. 40 p, 3 fig, 13 tab, 16 ref, append. OWRT A-077-MISS(1).

Descriptors: *Organic wastes, Water pollution, Aquatic life, *Mississippi, Water quality, Water pollution effects, Path of pollutants, *Waste disposal, Dissolved oxygen.
Identifiers: *Offal disposal, Stream recovery, *Animal processing wastes.

Two streams in Mississippi that receive offal from animal processing plants were chosen to monitor the effects of such animal wastes on the stream's water quality, fauna and flora. Sampling stations were established systematically to evaluate the recovery zone for these streams, if biological and chemical alterations occurred. Significant increases in carbon dioxide and orthophosphate levels occurred below the outflows in both receiving streams. Dissolved oxygen was significantly decreased in small, secondary flowage that carried the offal from the outflow pipe to the study stream on one of the study areas. No significant reduction could be detected in dissolved oxygen content in either of the primary streams studied. Other than orthophosphates, which were still detectably high five miles below the outflow on one of the streams, all chemical characteristics of both streams had returned to normal at the last station or were not measurably affected by offal disposal. Certain flora and fauna populations in one of the study streams were significantly altered at the point of intromission of the offal, but, because of another potential source of contamination, these alterations could not be directly associated with offal disposal.
W74-13053

CADMIUM CONTENT AND DISTRIBUTION IN THE MUD, BLOOD CLAMS, FISH FLESH AND THE ALGA, PORPHYRA TENERA, IN THE ARIAKE BAY (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries Chemistry.
For primary bibliographic entry see Field 5B.
W74-13073

AVOIDANCE BEHAVIOR OF INSECTICIDE SUSCEPTIBLE AND RESISTANT POPULATIONS OF MOSQUITOFISH TO FOUR INSECTICIDES,
Arizona Cooperative Fishery Unit, Tucson.
B. Kynard.
Transactions of the American Fisheries Society, Vol 103, No 3, p 557-561, July 1974. 1 fig, 2 tab, 14 ref.

Descriptors: *Insecticides, *Resistance, *DDT, *Endrin, Adaptation, Toxicants, Environmental effects, Laboratory tests, Methodology, Chlorinated hydrocarbon pesticides, Organophosphorous pesticides, Bioassay, Behavior, Fish behavior, Pesticides.
Identifiers: *Mosquitofish, *Gambusia affinis, Insecticide tolerance, Avoidance, *Parathion, *Toxaphene, Y-maze.

Mosquitofish, Gambusia affinis, from two populations differing greatly in insecticide tolerance were tested for their ability to avoid concentrations of DDT, endrin, toxaphene and parathion in a Y maze. Both groups avoided endrin, toxaphene and parathion. DDT was avoided by susceptible fish but not by resistant fish. Resistant fish avoided damaging concentrations (except DDT) better than did susceptible fish. (Katz)
W74-13074

DISTRIBUTION AND CONDITION OF FISHES IN A SMALL RESERVOIR RECEIVING HEATED WATERS,
North Texas State Univ., Denton. Dept. of Biological Sciences.
D. L. McNeely, and W. D. Pearson.

Transactions of the American Fisheries Society, Vol 103, No 3, p 518-530, July 1974. 6 fig, 4 tab, 30 ref.

Descriptors: *Heated water, *Distribution patterns, *Thermal stratification, *Reservoirs, *Temperature, *Channel catfish, Minnows, Aquatic habitats, Cooling water, Stratification, Effluents, Sunfishes, Catfishes, Industrial wastes, Dissolved oxygen, Analytical techniques, Seasonal, Environmental effects, Water chemistry, *Thermal pollution, Water pollution effects.
Identifiers: Condition coefficient, Crappie, Menidia audens, Notropis emilae, Cyprinus carpio, Shad.

The effects of thermal effluent on the distribution and condition of fishes were determined in a 330-ha reservoir in northeastern Texas. Fish were collected at five stations every 2 weeks between May 1971 and June 1972. Water temperatures at the mouth of the effluent canal were highest (42.2C) in July and were 3-8C higher at this location than in other areas of the reservoir. Mississippi silversides (Menidia audens) and pugnose minnows (Notropis emilae) forage species were never found near the mouth of the effluent canal. White crappie (Pomoxis annulans) and river carpsucker (Cyprinus carpio) may have been attracted to the effluent area in spring and summer. Several species were found distributed evenly throughout the reservoir. The size and condition of fishes collected at the mouth of the effluent canal were not significantly different from those of fish collected at other stations in the reservoir although the condition coefficients of channel catfish, river carpsucker, gizzard shad, threadfin shad, and bluegill were lower than those reported in other locations. Results suggest that the effects of heated effluents in small reservoirs may be generalized over the entire body of water, particularly when a cool-water refuge area is present beneath the heated surface stratum. (Katz)
W74-13076

RESPIRATORY RESPONSES TO HYPOXIC CONDITIONS IN CRUCIAN CARP LIVING IN DIFFERENT HABITATS, (IN JAPANESE),
Shiga Univ., Otsu (Japan). Faculty of Education.
N. Suzuki, and K. Kanzaki.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 40, No 1, p 57-62, January 1974. 3 fig, 21 ref. (English summary).

Descriptors: *Dissolved oxygen, *Respiration, *Carp, Laboratory tests, Habitats, Adaption, Speciation, Water pollution effects.
Identifiers: *Hypoxia conditions, *Opercular rates, Carassius auratus cuvieri, Carassius auratus gobelio, Gengorobuna, Hiwara, Goldfish.

Adult carp (Carassius auratus cuvieri) inhabit the upper of middle layer of offshore waters where hypoxic conditions rarely occur. Carassius auratus gibelio are found in lagoons and bay bottoms where hypoxia is a common condition. Oxygen consumption and opercular rate were measured in the laboratory in crucian carp living in different habitats, with various oxygen concentrations. Marked differences in critical concentration of oxygen consumption were not detected between the two varieties. In Carassius auratus cuvieri, a decrease in dissolved oxygen concentration first evoked an increase in opercular movement at a dissolved oxygen concentration of 3 ml/l; maximum opercular movement occurred at a lower oxygen concentration (2 ml/l); and disruption of the opercular rhythm was not detected within the range of oxygen concentrations employed in the experiments. These results show that opercular movements of Carassius auratus cuvieri must be more sensitive to lower oxygen tension and thus Carassius auratus cuvieri is less adaptive to hypoxic conditions than Carassius auratus gibelio. (Katz)
W74-13077

EFFECTS OF ANTIBODIES ON SURVIVAL OF CARANGID FISH LARVAE (CARANX MATE), REARED IN THE LABORATORY,
Hawaii Inst. of Marine Biology, Kaneohe.
J. W. Struhsaker, D. Y. Hashimoto, S. M. Girard, F. T. Prior, and T. D. Cooney.
Aquaculture, Vol 2, No 1, p 53-88, May 1973. 11 fig, 8 tab, 30 ref.

Descriptors: *Antibiotics(Pesticides), *Larvae, *Chlorella, Laboratory animals, Marine fish, Bactericides, Bacteria, Immature growth stage, Sea water, Hatching, Commercial fish, Aquaculture, Methodology, Aeration, Phytoplankton, Algae, Growth rate, Pseudomonas, Water pollution effects.
Identifiers: *Erythromycin, *Caranx mate, *Rearing technique, Penicillins, Polymyxins, Survival, Carangid.

Techniques are described which have proven successful in rearing the larvae of nine species of marine fishes in Hawaii. The results of intensive experiments on larvae of the carangid fish, Caranx mate, are presented, with emphasis on the effects of various antibiotics on bacterial populations in rearing containers and on larval survival. Suitable foods for the Caranx mate larvae are discussed and bacteria found in rearing containers and from natural water samples are identified. Of a number of antibiotics tested, the most effective in decreasing bacteria in sea water and enhancing hatching success and larval survival were the polymyxins, penicillins, and especially erythromycin. (Katz)
W74-13079

TOXICITY OF CHLORINE AND HEAT TO PINK (ONCORHYNCHUS GORBUSCHA) AND CHINOOK SALMON (O. TSHAWYTSCHA),
Washington Univ., Seattle. Fisheries Research Inst.
Q. J. Stober, and C. H. Hanson.
Transactions of the American Fisheries Society, Vol 103, No 3, p 569-576, July 1974. 6 fig, 14 ref.

Descriptors: *Toxicity, *Chlorine, *Chinook salmon, *Pink salmon, *Salmon, *Temperature, Fish behavior, Sea water, Bioassay, Mortality, Juvenile fish, Laboratory tests, Equilibrium, Salmonids, Chemical degradation, Methodology, Spectrophotometry, Analytical techniques, Water pollution effects, Environmental effects, Pesticide residues.
Identifiers: Oncorhynchus gorbuscha, Oncorhynchus tsawytscha, LD50, LT50, Sublethal limits.

The toxicity of chlorine to juvenile chinook salmon was tested at five residual concentrations ranging from 0.05 to 1.0 mg/liter and at four temperatures (delta t 0, 2.6, 4.6 and 10C) in a matrix design. Juvenile pink salmon were tested at three temperatures (delta t 0, 5.0, and 9.9C). Each matrix was stressed at four exposure periods (7.5, 15, 30, and 60 mon.). The LC50 and LT50 values are presented for each of the conditions tested. A decrease in the tolerance of both species to residual chlorine was demonstrated with increasing temperature and exposure time. The 60-minute exposure period and the 9.9 and 10C delta t were the most acutely toxic to each species. The equilibrium loss response for chinook salmon exposed to heat and chlorine preceded the LT50 by at least 55%. The LC50 was 0.045 mg/liter for both species after exposure to fluctuating chlorine concentrations during 2-hr periods. The LT50 occurred in about 100 minutes at approximately 0.5 mg/liter residual chlorine. Factors contributing to the dynamics of chlorine decay in sea water are discussed. The effect of light reduced the required time to decay (1.0--0.01 mg/liter) by a factor of about 7. The need for fish behavioral studies is suggested as a logical extension of this investigation. (Katz)
W74-13080

RHODE ISLAND SOUND DREDGE SPOIL DISPOSAL AND TRENDS IN THE FLOATING TRAP FISHERY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
M. P. Sissenwine, and S. B. Saila.
Transactions of the American Fisheries Society, Vol 103, No 3, p 498-506, July 1974. 11 fig, 3 tab, 13 ref.

Descriptors: *Dredging, *Waste disposal, *Rhode Island, Commercial fishing, Turbidity, Commercial fish, Trapping, Striped bass, Regression analysis, Water pollution effects.
Identifiers: *Dredge spoil, *Floating traps, *Scup, Dumping, Stenotomus chrysops, Bluefish, Cod, Mackerel, Menhaden.

Data was evaluated to assess the impact of the Rhode Island Sound dredge spoil disposal area on the floating trap fishery. It is unlikely that a significant portion of the observed decline in landings has resulted from a decrease in fishing effort since no correlation was established between these variables. The mean levels of landings were not significantly different when comparisons were made between the period before the onset of dumping and the short post-dumping period. A review of other fisheries for scup (Stenotomus chrysops), the predominant species caught by Rhode Island floating traps, indicated that landings have declined throughout the species' range. (Katz)
W74-13081

EFFECTS OF AROCLOR 1254 ON LABORATORY-REARED EMBRYOS AND FRY OF SHEEPSHEAD MINNOWS (CYPRINODON VARIEGATUS),
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
S. C. Schimmel, D. J. Hansen, and J. Forester.
Transactions of the American Fisheries Society, Vol 103, No 3, p 582-586, July 1974. 2 fig, 4 tab, 11 ref.

Descriptors: *Minnows, *Fish hatcheries, *Aroclor, *Clorinated hydrocarbon pesticides, Immature growth stage, Juvenile fish, Fry, Temperature, Salinity, Bioassay, Methodology, Resistance, Toxicity, Mortality, Food chains, Laboratory tests, Hatching, Pesticides, Sea water, Statistical models, Water pollution effects.
Identifiers: *Cyprinodon variegatus, *Sheepshead minnow.

Eggs of the sheepshead minnow were artificially fertilized and maintained at temperatures from 15 to 35C and in salinities from 0 to 35 parts per thousand to determine efficient culture conditions. Fertilization was not affected by temperature or salinity ranges chosen, but hatching success was greatest at a temperature range of 24 to 35C and a salinity range of 15 to 30 parts per thousand. Artificially fertilized sheepshead minnow eggs were exposed to logarithmic concentrations of Aroclor 1254 (10.0 to 0.1 microgram/liter) in seawater averaging 30C and 24 parts per thousand in a flow-through bioassay. Fertilization was not affected but significantly fewer embryos developed in the 10.0 microgram/liter concentration, and fewer fry survived in concentrations greater than 0.1 microgram/liter. Fry were more susceptible to Aroclor 1254 than were embryos, juveniles, or adults. (Katz)
W74-13082

PCB CONTENTS IN MARINE ANIMALS IN TOKYO BAY, (IN JAPANESE),
Tokai Regional Fisheries Research Lab., Tokyo (Japan).
H. Shimma, S. Arima, and K. Nagakura.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 39, No 11, p 1151-1162, November 1973. 4 fig, 4 tab, 7 ref. (English summary).

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Marine animals, *Chlorinated hydrocarbon pesticides, Clams, Chemical analysis, Lipids, Food chains, Sharks, Shrimp, Methodology, Gas chromatography, Analytical techniques, Path of pollutants, Water pollution effects.
Identifiers: *Tissue analysis, *Japan(Tokyo Bay), Extraction methods, Bioconcentration, Sea squirt, Puffer, Starfish.

The PCB contents of 30 species of marine animals in Tokyo Bay were determined. Four species of fish caught around Hateruma Island, Okinawa, were also analyzed for comparison with those in Tokyo Bay. Several extraction methods were tested and all but the direct-alkali-digestion method gave the same results. PCB values of fish meats from Okinawa were 0.02-0.1 ppm. The samples from Tokyo Bay had a maximum value of 2 ppm in puffer and a minimum of 0.01 ppm in bloody clam and sea squirt. All these results suggested that the accumulation of PCB might be caused by a food chain. The highest PCB value based on fat content was 603 ppm in the meat of spotted shark. The PCB values of viscera were always higher than those of meat. On a fat basis, the differences between viscera and meat values were somewhate smaller. The gas chromatographic patterns of PCB in the samples differed not only between fish species but also between the viscera and meat of the same fish. (Katz)
W74-13083

EFFECT OF POLYCHLORINATED BIPHENYL COMPOUNDS ON SURVIVAL AND REPRODUCTION OF THE FATHEAD MINNOW AND FLAGFISH,
National Water Quality Lab., Duluth, Minn.
A. V. Nebeker, F. A. Puglisi, and D. L. DeFoe.
Transactions of the American Fisheries Society, Vol 103, No 3, p 562-568, July 1974. 1 fig, 9 tab, 12 ref.

Descriptors: *Aroclors, *Clorinated hydrocarbon pesticides, *Polychlorinated biphenyls, Pesticides, Bioassay, Lethal limit, Toxicity, Toxicants, Minnows, Absorption, Reproduction, Resistance, Growth rates, Laboratory tests, Methodology, Enzymes, Hatching, Analytical techniques, Gas chromatography, Immature growth stage.
Identifiers: *Pimephales promelas, *Jordanella floridae, *LC50, *Flagfish, Bioconcentration, Continuous-flow bioassay.

Two 9-month continuous-flow bioassays and several intermediate length continuous-flow tests were conducted to determine safe levels of Aroclor 1242, 1248 and 1254 for the fathead minnow (Pimephales promelas) and Arochlor 1248 for the flagship (Jordanella floridae). Calculated 96-hr LC50 values for newly hatched fathead minnows were 7.7 microgram/liter for Aroclor 1254 and 15 microgram/liter for 1242. Three-month-old fatheads had a 96-hr LC50 of 300 microgram/liter for 1242. Reproduction occurred at and below 1.8 microgram/liter 1254 and at and below 5.4 microgram/liter 1242. Newly hatched young were the most sensitive life stage. Growth of young fatheads and flagfish was also affected above 2.2 microgram/liter 1248, and none survived above 5.1 microgram/liter after 30 days. Tissue residues in fathead minnows ranged from 0.7 microgram/g 1248 in control fish to 1036 microgram/g 1254 in fish held for 8 months in water containing 4.6 microgram/liter 1254. (Katz)
W74-13085

DISTRIBUTION OF BOTTOM FISHES IN RELATION TO OXYGEN CONTENTS IN THE BOTTOM WATER OR OMURA BAY, (IN JAPANESE),
Nagasaki Prefecture Fisheries Experiment Station (Japan).
I. Mori, T. Tokunaga, M. Kuwaoka, and T. Fugiki.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 39, No 7, p 753-758, July 1973. (English summary).

Descriptors: *Dissolved oxygen, *Distribution, Commercial fishing, Benthos, Benthic fauna, *Water pollution effects, Oxygen, *Oxygen demand, Shrimp, Fish, *Bays.
Identifiers: *Japan(Omura Bay).

Dissolved oxygen concentrations were determined for the bottom layer of Omura Bay. Fish and other marine organisms were collected by trawling and the effect of oxygen distributions on the distributions of bottom living organisms was investigated. An oxygen content lower than 1 ml/l appeared to be an extremely unfavorable environment. Bottom living organisms, for the most part, last activity and died. Thos that could avoid the low oxygen environment moved towards better conditions and formed fishing areas. (Katz)
W74-13086

TOXICITY OF SYNTHETIC DETERGENTS TO FISH AND AQUATIC INVERTEBRATES,
Aston Univ., in Birmingham (England). Dept. of Biological Sciences.
P. D. Abel.
Journal of Fish Biology, Vol 6, No 3, p 279-298, May 1974. 1 fig, 1 tab, 71 ref.

Descriptors: *Detergents, *Toxicity, *Aquatic animals, *Alkylbenzene sulfonates, Hardness(Water), Temperature, Dissolved oxygen, Water quality, Fishkill, Methodology, Mortality, Bioassay, Growth rate, Fish behavior, Inhibition, Biochemistry, Fish physiology, Environmental effects, Membranes, Publications, Invertebrates, Fish, Testing, Water pollution effects.
Identifiers: *Gills, *Sublethal effects, Literature survey, LC50, Mode of Action, Tolerance.

Synthetic detergents are reported to be acutely toxic to fish in concentrations between 0.4 and 40 mg/l. Factors affecting toxicity include the molecular structure of the detergent, water hardness, temperature and dissolved oxygen concentration; the age and species of the test fish, and acclimation to low concentrations of detergent. Some of these factors appear to be of only limited importance. Gill damage is the most obvious acute toxic affect; the immediate cause of death may be asphyxiation, but detergents may also be toxic internally. Sublethal effects include retardation of growth, alteration of feeding behavior and inhibition of chemoreceptor organs. Low levels of detergents may also increase the uptake of other pollutants. Invertebrates, especially in their juvenile stages, are extremely sensitive to detergents: concentrations below 0.1 mg/l interfere with growth and development in some species. The interactions between detergents and proteins, and their influence on membrane permeability may be the basis of biological action of detergents. Detergents in natural waters are usually partially degraded, and a maximum permissile concentration of 0.5 mf/l would probably be harmless under most conditions. (Katz)
W74-13087

THE EFFECT OF ALGAE ON THE WATER CONDITIONS IN FISH REARING TANKS IN RELATION TO THE GROWTH OF JUVENILE SOLE, SOLEA SOLEA (L.),
Ministry of Agriculture, Fisheries and Food, Port Erin (England). Fisheries Lab.
R. Alderson, and B. R. Howell.
Aquaculture, Vol 2, No 1, p 281-288, May 1973. 3 fig, 1 tab, 8 ref.

Descriptors: *Fish toxins, *Ammonia, *Growth rate, Laboratory tests, Fish physiology, Algae, Fish management, Metabolism, Methodology, Bioassay, Nitrogen compounds, Hydrogen ion concentration, Water pollution effects.
Identifiers: *Dunaliella tertiolecta, *Sole, *Solea solea.

In an experiment in which fish were held in static water, ammonia accumulated only in those tanks which did not contain a population of the unicellular alga Dunaliella tertiolecta. The poorer growth of the fish held in the tanks without algae is suggested as being related to this result. (Katz)
W74-13088

SOME HEAVY METALS IN SPRAT (SPRATTUS SPRATTUS) AND HERRING (CLUPEA HARENGUS) FROM THE INNER OSLOFJORD),
Oslo Univ. (Norway). Lab. for Marine Zoology and Marine Chemistry.
A. T. Andersen, A. Dommasnes, and I. H. Hesthagen.
Aquaculture, Vol 2, No 1, p 17-22, May 1973. 1 fig, 2 tab, 2 ref.

Descriptors: *Baseline studies, *Copper, *Zinc, *Cadmium, *Lead, *Herrings, Water quality, Water quality standards, *Heavy metals, Metals, Monitoring, Domestic wastes, Commercial fish, Methodology, Spectrophotometry, Bioassay, Path of pollutants, Absorption, Water pollution effects, Pollutant identification.
Identifiers: *Sprat, Clupea harengus, Sprattus sprattus, *Norway(Oslofjord).

As part of a baseline study initiated in the Oslofjord, Norway, concentrations of copper, zinc, cadmium and lead have been measured in the age-groups 0 and 1 sprat, Sprattus sprattus (L), and in 0-group herring, Clupea harengus (L). Values for the concentrations of these metals in the sea-water are also given. The results of these findings are discussed. Copper and lead content are greater in young sprat and herring; zinc content is greater in older fish. Cadmium content shows little variation correlated with age. (Katz)
W74-13089

EFFECTS OF WATER QUALITY, ANTIBIOTICS, PHYTOPLANKTON AND FOOD ON SURVIVAL AND DEVELOPMENT OF LARVAE OF SCYLLA SERRATA (CRUSTACEA: PORTUNIDAE),
Hawaii Inst. of Marine Biology, Kaneohe.
R. W. Brick.
Aquaculture, Vol 3, No 3, p 231-244, June 1974. 5 fig, 4 tab, 24 ref.

Descriptors: *Crabs, *Larvae, Water quality, *Phytoplankton, *Antibiotics(Pesticides), Immature growth stage, Commercial shellfish, Chlorella, Methodology, Laboratory tests, Temperature, Algae, Water pollution effects.
Identifiers: *Scylla serrata, Zoeae, *Megalopa, Development, Penicillin-G, Polymyxin-B, Artemia salina, Survival.

Larvae of the portunid crab were successfully reared using a combination of antibiotics (penicillin-G + polymyxin-B), phytoplankton (Chlorella sp.) and appropriate food (Artemia salina nauplii). Antibiotics enhanced premetamorphic survival of zoeae while leaving rate of development unaltered. Water filtration and ultraviolet sterilization had no significant effect on rates of zoeal survival or development. The presence of Chlorella did not affect zoeal survival as it stimulated production of megalopae. Survival and development of zoeae varied with type and concentration food organisms with the highest larval survival resulting from feeding with Artemia nauplii. A daily optimum food concentration was established for zoeal survival and for success of metamorphosis of zoeae to megalopa. (Katz)
W74-13090

PROBLEMS WITH DUMPING OF RED MUD IN SHALLOW WATERS. A CRITICAL REVIEW OF SELECTED LITERATURE,
Bundesforschung sanstalt fuer Fischerei, Hamburg (West Germany). Institut fuer Kuesten- und Binnenfischerei Isotopenlaboratorium.
V. Dethlefsen, and H. Rosenthal.

Aquaculture, Vol 2, No 3, p 267-280, August 1973. 5 fig, 1 tab, 28 ref.

Descriptors: *Industrial wastes, *Aluminum, Herrings, Environmental effects, Water quality control, Water pollution sources, Water pollution effects, Benthos, Benthic fauna, Commercial fishing, Hydrogen ion concentration, Fish, Publications, Microscopy, Larvae.
Identifiers: *Red mud, *Gills, *North Sea, Literature review, Bauxite, Sole, Turbot, Haddock.

Red mud is an industrial waste originating from the production of aluminum from bauxite. Experiments were carried out to assess the affects on marine organisms of disposal in the southern North Sea. Red mud proved to be harmful to a variety of organisms; the most predominant effect was agglutination of gill tissues. Considering the very severe effects of suspended red mud on different marine organisms, the proposed dumping project seems inadvisable. Taking into account the hydrographic situation of the German Bight it is concluded that dumping of red mud would endanger the stocks of bottom fish and fauna and should therefore take place in regions without any fishing activities with depth greater that 3000 meters. (Katz)
W74-13091

THE EFFECTS OF HYPOXIA ON CERTAIN BLOOD AND TISSUE ELECTROLYTES ON CHANNEL CATFISH, ICTALURUS PUNCTATUS (RAFINESQUE),
Southern Illinois Univ., Carbondale. Dept. of Zoology.
W. L. Kirk.
Transactions of the American Fisheries Society, Vol 103, No 3, p 593-600, July 1974. 5 tab, 30 ref.

Descriptors: *Channel catfish, *Oxygen, *Fish physiology, *Electrolytes, Dissolved oxygen, Stress, Environmental effects, Methodology, Bioassay, Hydrogen ion concentration, Sodium, Potassium, Analytical techniques, Spectrophotometry, Laboratory tests, Biochemistry, Water pollution effects.
Identifiers: *Hypoxia, Blood chemistry, *Hematocrit, Ictalurus punctatus.

Channel catfish exhibited changes in levels of muscle and blood electrolytes during recovery from short-term hypoxia. Ten minutes of confinement in water having zero mg/liter oxygen resulted in an acidosis characterized after 1 hr of recovery by elevated blood lactate, decreased blood pH, and an increase in plasma osmolarity and hematocrit. Muscle water content was increased at this time. Later changes in these parameters appeared to be influenced by season or temperature. Plasma osmolarity dropped below control levels in June and remained depressed after 36 hr of recovery. In August plasma osmolarity fluctuated at levels above control values and had not returned to normal after 48 hr. These data indicate that electrolyte unbalance persists for many hours after blood lactate has declined to control levels and this imbalance may limit the fish's ability to tolerate further stress. (Katz)
W74-13092

ORGANOCHLORINE RESIDUES, MERCURY, COPPER AND CADMIUM IN YELLOW PERCH, WHITE BASS AND SMALLMOUTH BASS, LONG POINT BAY, LAKE ERIE,
Ontario Ministry of Natural Resources, Port Dover.
J. R. M. Kelso, and R. Frank.
Transactions of the American Fisheries Society, Vol 103, No 3, p 577-581, July 1974. 2 fig, 1 tab, 16 ref.

Descriptors: *DDT, *Polychlorinated biphenyls, *Pesticides, *Mercury, *Copper, *Cadmium, *Bass, *Perches, Freshwater fish, *Lake Erie, Metals, Heavy metals, Bioassay, Absorption, Age, Dieldrin, Chlorinated hydrocarbon pesticides, White bass, Yellow perch, Methodology, Chromatography, Analytical techniques, Seasonal, Lipids, Metabolism, Water pollution effects.
Identifiers: *Tissue analysis, Bioconcentration, Perca flavescens, Morone chrysops, Micropterus dolomieui.

Three collections of yellow perch, white bass and smallmouth bass were made in May, July, and late October for analyses of DDT, PCB, mercury, copper and cadmium. Total DDT residues were low for all species. Means ranged from 0.09 to 0.27 ug/g and exhibited no seasonal changes. No difference among species existed for DDT in spite of differing fat content, but concentrations within a species increased with increasing fat and subsequently age. PCB's were up to 6.5 times greater than DDT levels. PCB residues, lowest in yellow perch and highest in white bass, did not vary with season but increased with increasing fat. Dieldrin was low and no trends relating to season or fat were apparent. Only two specimens contained mercury residues above 0.5 ug/g. Mercury was apparently related to size and subsequently age. Copper was slightly higher in yellow perch, means ranged from 1.29 to 1.56 ug/g, but copper and cadmium were low in all species. (Katz)
W74-13093

EFFECT OF TFM AND BAYER 73 ON IN VIVO OXYGEN CONSUMPTION OF THE AQUATIC MIDGE CHIRONOMUS TENTANS,
Viterbo Coll., La Crosse, Wis. Dept. of Biology.
J. A. Kawatski, V. K. Dawson, and M. L. Reuvers.
Transactions of the American Fisheries Society, Vol 103, No 3, p 551-556, July 1974. 2 fig, 1 tab, 18 ref.

Descriptors: *Respiration, *Midges, *Larvae, *Hardness(Water), Aquatic insects, Metabolism, Toxicants, Invertebrates, Benthic fauna, Diptera, Methodology, Analytical techniques, Toxicity, Biochemistry, Larvicides, Water pollution effects.
Identifiers: TFM, Bayer 73, *Chironomus tentans, *Sublethal effects, 3-trifluormethyl-4-nitrophenol, Respirometer, In vivo, Uncouplers.

Exposure of larvae of Chironomus tentans to 2.0-8.0 mg/liter of TFM (3-trifluormethyl-4-nitrophenol) for 6 hr at 22 plus or minus 0.5C in soft water resulted in a significantly increased rate of larval oxygen consumption compared to control larvae. Maximum stimulation of oxygen consumption occurred with 8.0 mg/liter of TFM, and 1.0 mg/liter of TFM had no measurable effect on basal respiration. When water hardness was progressively increased, the effect of TFM on oxygen consumption was diminished. Bayer 73 (5,2'-dichloro-4'-nitrosalicylanilide) stimulated oxygen consumption at 0.75 and 1.0 mg/liter, had no significant effect at concentrations less than 0.75 mg/liter, and inhibited oxygen consumption at concentrations of 1.20 mg/liter or greater. Mixtures of TFM and Bayer 73, in the ratio of 98.2, had no greater effect on oxygen consumption than TFM alone. (Katz)
W74-13094

RECOVERY OF STANDING CROP AND PRODUCTION RATE OF A BROOK TROUT POPULATION IN A FLOOD-DAMAGED STREAM,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
D. L. Hanson, and T. F. Waters.
Transactions of the American Fisheries Society, Vol 103, No 3, p 431-439, July 1974. 6 fig, 7 tab, 20 ref.

Descriptors: *Brook trout, *Rainbow trout, *Growth rate, *Standing crops, *Biomass, *Productivity, *Flood damage, Population, Environmental effects, Floods, Salmonids, Streams, Minnesota, Water pollution effects.
Identifiers: Recovery, Cohort production, Valley Creek(Minnesota).

The brook trout (Salvelinus fontinalis) population in Valley Creek, Minnesota, recovered from heavy flood damage in 1955-66 in terms of standing crop, growth, and production rates over a period of 4 to 5 years. Standing crops increased numerically by 20-fold from a low of 498/ha in 1966 to 10,882/ha in 1959, and in biomass by 6-fold from 25 kg/ha in 1966 to a maximum of 148 kg/ha in 1970. Growth rate early in the recovery period was high but decreased in successive years as fish density increased. Annual productivity was about 50 kg/ha during the flood years but increased during the recovery years to a maximum of 167 kg/ha in 1969. Cohort production for the 1965 year class was about 15 kg/ha whereas it was 190 kg/ha for the 1968 year class. After the floods, rainbow trout immigrated into the study section from downstream; although variable in year class strength, the rainbow contributed substantially to total salmonid standing crop and annual production in some years. It has apparently become permanently established, even after total recovery of the brook trout population. (Katz)
W74-13095

THE USEFULNESS OF BIOLOGICAL TESTS FOR DETERMINING THE TOXICITY OF SOME CHEMICAL COMPOUNDS IN WATERS,
Wroclaw Technical Univ. (Poland). Zaklad Biologii Sanitarnej.
M. Pawlaczyk-Szpilowa, M. Moskal, and J. Weretelnik.
Acta Hydrobiologica, Vol 14, No 2, p 115-127, 1972. Polish summary. 1 tab, 35 fig.

Descriptors: *Toxicity, *Toxicants, *Testing procedures, *Analytical techniques, *Metabolism, Copper sulfate, Pesticides, Lead, Phenols, Potassium compounds, Chlorine, Industrial wastes, Water pollution sources, Bioassay, Chlorophyll, Microorganisms, Respiration, E. coli, Bacteria, Biomass, Algae, Enzymes, Biochemistry, Herbicides, *Pollutant identification.
Identifiers: Sensitivity, Lead acetate, Aniline, TCC test, Potassium permanganate, Arquard, Aresin, Paramecium caudatum, Daphnia magna, Dehydrogenase activity.

Investigations of the toxicities of different chemical compounds indicated that different test methods had varying sensitivities. The toxic action of copper sulfate (at 0.01 mg/l), of lead acetate (at 0.1 mg/l) and of phenol (at 10 mg/l) was detected earliest by the chlorophyll method. The action of aniline (at 0.1 mg/l) was detected earliest using the T.C.C. test and that of potassium permangate (at 0.1 mg/l) and of chlorine (at 0.1 mg/l) using Warburg's manometric method. The action of arquard (at 0.001 mg/l) and of aresin (at 0.001 mg/l) was detected using Paramecium caudatum. Tested organisms exhibited an acceleration of their basic metabolic functions, especially of respiration and photosynthesis, when applying sub-limit concentrations, verging directly on toxic doses. (Katz)
W74-13097

ACCUMULATION OF SR IN MARINE ORGANISMS- I. STRONTIUM AND CALCIUM CONTENTS, CF AND OR VALUES IN MARINE ORGANISMS,
National Inst. of Radiological Sciences, Chiba (Japan). Dept. of Environmental Contamination.
T. Ueda, Y. Suzuki, and R. Nakmura.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 39, No 12, p 1253-1262, December 1973. 2 fig, 6 tab, 15 ref.

Descriptors: *Strontium, *Calcium, *Absorption, *Marine algae, *Marine animals, Strontium radioisotopes, Public health, Metals, Water pollution sources, Spectrophotometry, Analytical techniques, Sea water, Mollusks, Food chains, Crustaceans, Phaeophyta, Rhodophyta, Algae,

Chlorophyta, Methodology, Bioindicator, Water pollution effects.
Identifiers: *Tissue analysis, Bioconcentration, Concentration factor, Mugil cephalus, Gadus macrocephalus, Mollusk shell.

The amount of Sr and Ca in various marine organisms were determined by atomic absorption spectrophotometry and the concentration factor (CF; Sr organism/ Sr sea water) and observed ration (OR; (Sr/Ca)organism Sr/Ca)sea water) were calculated. The average content of Sr was highest in molluscan shell (1155 mg/kg raw) and decreased in crustacean exoskeleton, echinoderm, fish bone, brown algae and coelenterata in this order. The Ca content was also highest in molluscan shell (249 g/kg raw) among the marine organisms studied. The CF value of Sr ranged from 0.3 for a red algae to 325 for a crustacean. The CF value of brown algae was one order of magnitude higher than those of green and red algae, and was rather similar to those of hard tissues of marine animals. The OR value changed from 0.17 for shell of bivalvia (mollusca) to .82 for exoskeleton of stomatopoda (crustaces). However, the OR value of brown algae was extremely high (3.74) because of the affinity of Sr to alginic acid which was abundant in brown algae. (Katz)
W74-13098

INFLUENCE OF ECOLOGICAL FACTORS ON THE CONDITION COEFFICIENT OF A TELEOSTEAN FISH (COTTUS GOBIO L.) (INFLUENCE DES FACTEURS ECOLOGIQUES SUR LE COEFFICIENT DE CONDITION D'UN TELEOSTEEN (COTTUS GOBIO L.),
Station d'Hydrobiologie Continentale, Biarritz (France).
M. Laurent, and G. Moreau.
Annales D'Hydrobiologie, Vol 4, No 2, p 211-218, 1973. 2 fig, 5 tab, 14 ref. English summary.

Descriptors: *Fish hatcheries, *Statistical models, *Sculpins, Statistics, Analytical techniques, Age, Regression analysis, Organic wastes, Water pollution effects, Mathematical models.
Identifiers: *Condition coefficient, *Cottus gobio, Hatchery wastes.

Results of the study of samples of two different Cottus gobio (L) populations originating from two different areas of the same stream on both sides of hatchery sewage, have been statistically analyzed. A method of logarithmic differences make it possible to differentiate age groups. The analysis of condition coefficients worked out for the two populations or for each of their age groups proved more interesting than that of parameters of the regression line length/weight for revealing differences in growth. The analysis shows that, for the same age, the condition coefficient of downstream sculpins is significantly higher than that of upstream sculpins. The two areas are practically identical for all ecological conditions except the hatchery organic discharge and it is logical that this is the cause of increased condition coefficient in downstream sculpins. Variations in values of this parameter in time or space could be considered, all other conditions being equal, as corresponding to variations in organic matter content of the environment. (Katz)
W74-13099

METHODS FOR THE DETECTION OF CERTAIN PATHOGENS OF SALMONID FISHES,
Department of the Environment, Winnipeg (Manitoba). Fisheries and Marine Services.
For primary bibliographic entry see Field 5A.
W74-13100

ACUTE TOXICOLOGY TO AN ESTUARINE TELEOST OF MIXTURES OF CADMIUM, COPPER AND ZINC SALTS,
National Marine Water Quality Lab., West Kingston, R.I.
R. Eisler, and G. R. Gardner.
Journal of Fish Biology, Vol 5, p 131-142, 1973. 4 fig, 1 plate, 4 tab, 16 ref.

Descriptors: *Toxins, *Zinc, *Copper, *Cadmium, *Toxicity, Salts, Teleosts, Estuaries, Bioassay, Mortality, Methodology, Analytical Techniques, Spectroscopy, Pathology, Ions, Heavy metals, Lethal limit, Absorption, Water pollution effects.
Identifiers: *Mummichog, *Histopathology, *Synergistic effects, Fundulus heteroclitis, Renal lesions.

Effects of mixtures of chloride salts of cadmium, cooper and zinc on survival, whole body residues, and histopathology of mummichog, Fundulus heteroclitis, were investigated in synthetic seawater at 20 parts/thousand salinity and 20 degrees C. Mixtures of Cu2+ and Zu2+ as indicated by 96h bioassay studies produced more deaths than expected on the basis of toxicities of individual components. Concentrations of Cd2+ not ordinarily lethal exerted a negative effect on survival of fish intoxicated by salts of copper, zinc or both. Survivors of the 96h exposures of each of these toxicants provided useful indices of total body burdens for these metals through spectroscopy. Residues from survivors held in mixtures, especially Cd2+ and Zn2+ mixtures, did not conform to patterns observed for single elements. Renal and lateral line canal lesions occurred in all fish subjected to copper concentrations of lmg/l and higher. Tenal lesions in fish immersed in mixtures of Cu2+ and Cd2+ were characteristic of those from Cd2+; mixtures of Cu2+ and Zn2+ were typical of Cu2+ induced damage. Lesions induced in lateral line epithelium by Cu2+ were not affected by either Cd2+ or Zn2+. Epithelia lining the oral cavity were necrotized by the caustic action of high levels of Zn2+ (60 mg/l) and of Cu2+ (8 mg/l). (Katz)
W74-13101

ON THE EFFECTS OF DUMPED ORGANIC INDUSTRIAL WASTE DERIVING FROM THE PRODUCTION OF PROTEOLYTIC ENZYMES ON DENSITY, DISTRIBUTION AND QUALITY OF FISH AND SHRIMPS,
Ministere de l'Agriculture, Ostend (Belgium). Sea Fisheries Research Station.
R. DeClerck, J. Van De Velde, and W. Vyncke.
Aquaculture, Vol 2, No 4, p 323-335, December 1973. 7 fig, 1 tab, 13 ref.

Descriptors: *Shrimp, *Organic wastes, *Commercial fish, *Organoleptic properties, Laboratory tests, Water pollution sources, Water pollution effects, Shellfish, Commercial shellfish, *Industrial wastes, Mollusks, Crustaceans, Waste disposal, Water pollution effects.
Identifiers: Sole, Sprat, Dab, Whiting, Plaice.

A one year study was made in the area of a dumping ground off the Belgian coast to define the effects of dumped organic waste from the production of proteolytic enzymes on the fish and shrimp stocks. The waste material sinks rapidly to the bottom and its rate of dispersion seems rather high. Some obstacle to fishing occurs during a few days after dumping owing to the waste lumps present. The dumped material showed no negative effects on the fish and shrimp stocks. An approach to the behavior of shrimps in a aquarium system indicated no adverse effects. The organic waste did not influence the quality and shelf life of shrimps. (Katz)
W74-13102

STUDIES ON THE INFLUENCE OF PCB ON AQUATIC ORGANISMS-II. CHANGES IN BLOOD CHARACTERISTICS AND PLASMA ENZYME ACTIVITIES OF CARP ADMINISTERED ORALLY WITH PCB (IN JAPAN),
Tokai Univ., Miyamae-cho, Shizuoka (Japan). Women's Coll.
Y. Ito.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 39, No 11, p 1135-1138, November 1973. 1 fig, 1 tab, 21 ref. English summary.

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *Aroclors, Carp, Enzymes, Chemical analysis, Proteins, Biochemistry, Fish physiology, Water pollution effects.
Identifiers: *Blood characteristics, Plasma, Glucaronidase, Hematocrit, Glucose content.

Changes in blood characteristics and plasma enzyme activities of carp, Cyprinus carpio, fed with diets containing 5, 25 and 100 ppm of PCB (Aroclor 1248) were examined. After 7 or 20 days feeding with PCB-containing diets, the carps were sacrificed for chemical analysis. After 7 days, the blood glucose content and hematocrit value in 5 and 25 ppm groups decreased, while in the 100 ppm group both values showed an increase. After 20 days feeding, the blood glucose content and hematocrit values were elevated with the dose of PCB. The protein content, p-glucaronidase and glutamate pyruvate transaminase activities showed an increasing tendency. After 20 days feeding, the glutamate oxaloacetate transaminase activities and alkaline phosphatase activity were greatly increased. The findings suggest that plasma p-glucaronidase activity may be a useful index for examining the effect of PCB in fish. (See also W74-13104 and W74-13105) (Katz)
W74-13103

STUDIES ON THE INFLUENCE OF PCB ON AQUATIC ORGANISMS-III. RELATIONSHIP BETWEEN THE INTAKE OF PCB AND ITS ACCUMULATION IN VARIOUS TISSUES OF CARP (IN JAPANESE),
Tokai Univ., Shizuoka (Japan). Women's Coll.
Y. Ito.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 39, No 11, p 1139-1143, November 1973. 4 fig, 2 tab, 10 ref. English summary.

Descriptors: *Carp, *Polychlorinated biphenyls, Bioassay, Gas chromatography, Analytical techniques, Lipids, Absorption, Chemical analysis, Chlorine, Water pollution effects, Pollutant identification.
Identifiers: *Tissue analysis, *Bioconcentration, Hepatopancreas, Isomers, Accumulation.

Carp were fed for 7 and 20 days with diets containing 5.25 and 100 ppm of PCB (Aroclor 1248) and analyzed gas chromatographically for its accumulation in various tissues. PCB was detected in all tissues analyzed. In hepatopancreas, the greatest amount of PCB was found. It was followed by the intestine, Kidney, gill, skin, and ordinary muscle. The amount of accumulation seemed almost parallel to the crude fat content in the tissue. Accumulation factors were different among the tissues. The gas chromatographic pattern of the once-absorbed PCB was different from that of the PCB mixture administered. The hepatopancreas, gill and kidney contained relatively high concentration of low chlorine PCB isomers and lower concentrations of high chlorine PCB isomers. The inverse was true in ordinary muscle. However, no marked changes in the PCB pattern were observed in the intestine. The results suggest that each isomer of PCB is almost equally absorbed from the intestinal tract and transported to the different tissues in carp. (See also W74-13103) (Katz)
W74-13104

STUDIES ON THE INFLUENCE OF PCB ON AQUATIC ORGANISMS - IV. CHANGES IN SERUM LIPID CONTENTS AND FORMATION OF LIPID PEROXIDE IN THE TISSUES OF CARP ADMINISTERED WITH PCB ORALLY, (IN JAPANESE),
Women's College, Tokai University, Miyamae-cho, Shizuoka, Japan.
Y. Ito, and T. Murata.

Bulletin of the Japanese Society of Scientific Fisheries, Vol 4, No 3, p 261-265, 1974. 1 fig, 1 tab, 26 ref. English summary.

Descriptors: *Carp, *Polychlorinated biphenyls, *Arochlors, *Pesticides, Analytical techniques, Spectrophotometry, Chlorinated hydrocarbon pesticides, Metabolism, Biochemistry, Bioassay, Animal physiology, Chemistry, Pollutants, Lipids, Water pollution effects.
Identifiers: Cholesterol, Thiobarbituric acid, Hepatopancreas.

Changes in the levels of several serum lipid components in the formation of lipid peroxides in hepatopancreas, kidney and the dark muscle of carp, Cyprinius carpio, fed with a diet containing PCB (Arochlor 1248) at 250 ppm were examined. After feeding with the PCB-containing diets for 7, 14 and 21 days, the carps were sacrificed for chemical analyses. Triglyceride, total cholesterol and free fatty acid contents were increased while the ester to total cholesterol ratio was decreased in the PCB fed group. The triglyceride levels in the carp fed with PCB showed substantial increases, more than 30%, compared with those of the control fishes. The thiobarbituric acid reactive compounds were shown to increase in the hepatopancreas and the dark muscle with the administered dosage of PCB. The lipid metabolism in carp fed with the diet containing PCB is discussed, indicating the possibility of lipid peroxide formation in subcellular membranes. (See also W74-13103) (Katz)
W74-13105

CALCULATIONS OF DOSE, POPULATION DOSE AND HEALTH EFFECTS DUE TO BOILING WATER NUCLEAR POWER REACTOR RADIONUCLIDE EMISSIONS IN THE UNITED STATES DURING 1971,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-13110

PRESOWING IRRADIATION OF SEEDS OF AGRICULTURAL PLANTS,
N. M. Berezina.
Available NTIS, Springfield, Va 22161 as AEC-tr-7540, $7.00/copy, $2.25 microfiche. Atomic Energy Commission Translation AEC-tr-7540, July 1974. 190 p, 35 fig, 149 tab, 383 ref. Translated from Predposevnoe obluchenie semyan sel'skokhozyaistvennykh rastenii-Atomizdat, Moscow 1964.

Descriptors: *Irradiation, *Genetics, *Seed treatment, *Reproduction, *Viability, Biology, Radioisotopes, Radioactivity effects, Productivity, Radioecology, Agriculture, Vegetable crops, Horticulture, Economics.
Identifiers: *Mutagens, *Radiobiology.

The principal reports on the effect of stimulating doses of radiation on seeds of agricultural plants are summarized, the theoretical basis of the technique is clarified, and the method of presowing irradiation of seeds is described. Familiarity with the material presented will permit eliminating repetition in work in this direction and a more rapid approach to the practical utilization of presowing irradiation of seeds in the agricultural economy. (Houser-ORNL)
W74-13115

THE DISTRIBUTION OF PLUTONIUM IN LIQUID WASTE DISPOSAL AREAS AT LOS ALAMOS,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W74-13117

KRA CANAL PROJECT: A PRELIMINARY ASSESSMENT OF NUCLEAR EXCAVATION FEASIBILITY FOR ROUTE 5A,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8H.
W74-13119

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 15. MAMMALS OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ., Stevens Point. Museum of Natural History.
For primary bibliographic entry see Field 6G.
W74-13121

ECOLOGICAL CONSIDERATIONS OF DEPLETED URANIUM MUNITIONS,
Los Alamos Scientific Lab., N. Mex.
W. C. Hanson.
Available from NTIS, Springfield, Va. as LA-5559, $3.25/copy, $2.25/microfiche. Report No LA-5559, June 1974. 7 p, 36 ref.

Descriptors: *Nuclear explosions, *Uranium, Fallout, *Military aspects, Civil defense, *Environmental effects, *Ecology, Ecosystems, Aquatic environment, Freshwater, Plants, Absorption, Marine plants, Marine animals, Toxicity, Chemical reactions, Water pollution, Soil contamination.
Identifiers: Weapons testing.

Ecological consequences of depleted uranium (DU) released to the environment as a result of military use of DU munitions were appraised by reviewing pertinent literature. Estimates were based upon ecosystem responses to natural uranium, which is more soluble and more toxic than DU. The major ecological hazard from expended uranium munitions will be chemical toxicity rather than radiation. The alloy nature of the munitions will substantially decrease the mobility of DU and mitigate the problem. However, the ecological aspects of the chemical toxicity of DU in terrestrial ecosystems is expected to be a major consideration of expended munitions. The ecological impact of fires from the detonation material is also reported. (Houser-ORNL)
W74-13122

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED BRAIDWOOD STATION, COMMONWEALTH EDISON COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
Available from NTIS, Springfield, Va. 22161 as Docket No 50456-55; $7.25/copy, $2.25/microfiche. Report No Docket STN-50456-55 and 50457-54, July 1974. 213 p, 36 fig, 48 tab, 139 ref, 7 append.

Descriptors: *Nuclear powerplants, Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Illinois, Lakes.
Identifiers: *Pressurized water reactors, *Kankakee River(Ill).

The site of the proposed Braidwood Station, Units 1 and 2, is near the Kankakee River in Will County, Illinois, and will employ two pressurized water reactors. The exhaust stream will be cooled by a once-through flow of water from an artificial lake. Makeup water will be drawn from and discharged to the Kankakee River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and groundwater), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to issue construction permits subject to the following: (1) avoid unnecessary adverse environmental impacts from construction activities; (2) follow specified environmental monitoring programs; (3) make periodic reviews of the construction activities for adverse impacts; (4) give written notice of significant impact problems unforeseen; (5) give staff an analysis and plan of action to eliminate harmful effects disclosed during construction. (Houser-ORNL)
W74-13129

A SELECTED, ANNOTATED BIBLIOGRAPHY OF THE CIVIL, INDUSTRIAL, AND SCIENTIFIC USES FOR NUCLEAR EXPLOSIONS.
Technical Information Center (AEC), Oak Ridge, Tenn.
Available from NTIS, Springfield, Va, as TID-3522-R9-S2; $5.75/copy, $2.25/microfiche. Report No TID-3522-R9-S2, April 1974. R. C. Kelly, Compiler. 146 p, 478 ref.

Descriptors: *Bibliographies, *Nuclear explosions, *Nuclear engineering, *Cost-benefit theory, *Benefits, Public benefits, Excavation, Underground, Secondary recovery(Oil), Natural gas, Hydrofracturing, Documentation, Publications, Environmental effects, Radioactive waste disposal, Mining, Water, Management.
Identifiers: *Plowshare.

A program to study the feasibility of using nuclear explosions for peaceful purposes has many potential pllications in such areas as excavation of harbors, canals, and mountain passes, production of transplutonium isotopes, neutron physics research, gas and oil recovery and storage, waste disposal, mining, and water management. Laboratory and field experiments are currently under way to develop basic technology and to evaluate proposed applications. This supplement to bibliography TID-3522 (9th Rev.) contains 478 references to reports and published literature on the USAEC's Plowshare Program that were published in Volumes 26 and 27 (January 1, 1972 to June 30, 1973) of Nuclear Science Abstracts. The references are arranged by subject category. Experiment, Foreign Literature, Corporate Author, Personal Author, Subject, and Report Number Indexes are included. (Houser-ORNL)
W74-13133

HABITATS OF SMALL MAMMALS AT WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
S. L. Iverson, and B. N. Turner.
Available from NTIS, Springfield, Va 22161 as AECL-3956, $4.25/copy, $2.25/microfiche. Report No AECL-3956, December 1973. 58 p, 3 fig, 22 tab, 27 ref.

Descriptors: *Speciation, *Varieties, *Surveys, Data collections, *Habitats, *Mammals, *Mixed forests, Coniferous forests, Deciduous forests, Environment, Environmental effect, Nuclear energy, Effluents, *Canada.
Identifiers: Whiteshell Nuclear Research Establishment(Manitoba).

The small mammals in the area around the Whiteshell Nuclear Research Establishment in southeastern Manitoba were sampled by approximately 110,000 snap-trap nights in a 5-yr period. Habitats trapped were divided into major types on the basis of the tree species present, and occurrences of the different species of shrubs and herbs in each habitat type were noted. The major

habitats were mixed deciduous, aspen, ash, mixed coniferous, black spruce and fir forests; black spruce bog and open field. The small mammal component of the mixed deciduous forest was dominated by Peromyscus maniculates and Clethrionomys gapperi. (Houser-ORNL)
W74-13137

MAN'S IMPACT ON THE COLORADO RIVER IN THE GRAND CANYON,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 4C.
W74-13149

QUANTITY OF BACTERIA AND DESTRUCTION OF ORGANIC MATTER IN BOTTOM DEPOSITS OF THE SARATOV WATER STORAGE BASIN (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W74-13156

CHARACTERISTICS OF BACTERIA IN WATER LAYERS OF THE SOUTH BAIKAL, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W74-13157

A STUDY OF DIETHYLENETRIAMINE IN CONNECTION WITH ITS HYGIENIC STANDARDIZATION IN WATER BODIES (IN RUSSIAN),
Sanitarno-Gigenicheskii Meditsinskii Institut, Leningrad (USSR).
E. I. Trubko, and E. V. Teplyakova.
Gig Sanit. Vol 37, No 7, p 103-104. 1972. Illus.
Identifiers: Guinea pig, Rabbit, Standardization, Organoleptic properties, *Diethylenetriamine, DTA, Water pollution effects, *Toxicity, *Lethal limit, Organic wastes.

The maximum allowable concentration of diethylenetriamine (DTA) in water was determined to be 0.2 mg/l with respect to the organoleptic properties of contaminated water. Water with 20 mg of DTA/1, administered to rabbits and guinea pigs in a chronic experiment, caused no alterations in the organism.--Copyright 1974, Biological Abstracts, Inc.
W74-13165

LIMNOLOGICAL, ICHTHYOLOGICAL, AND PARASITOLOGICAL INVESTIGATIONS ON ARKANSAS RESERVOIRS IN RELATION TO WATER QUALITY,
Arkansas Univ., Fayetteville. Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W74-13167

COMPARISON OF BACTERIAL AND PHYTOPLANKTON POPULATIONS UNDER NATURAL AND LABORATORY CONDITIONS,
Geological Survey, Albany, N.Y.
T. A. Ehlke.
Journal of Research, US Geological Survey, Vol 2, No 5, p 533-539, September-October, 1974. 1 fig, 4 tab, 24 ref.

Descriptors: *Algae, *Bacteria, *Lakes, *Limnology, *New York, Eutrophication, Nutrients, Plankton, Symbiosis, *Cyanophyta, Ecology, Primary productivity, Phytoplankton.
Identifiers: *Oneida Lake(NY).

Bacteria and blue-green algae were isolated from Oneida Lake, N.Y., and other sources. The blue-green algae Anabaena flos-aquae, Anabaena spiroides, Gloeotrichia echinulata, and Microcystis aeruginosa were grown under laboratory conditions and were separated into unialgal cultures. The bacterial population living in association with the unialgal blue-green algae differed significantly from the bacterial flora of Oneida Lake. Bacillus, Pseudomonas, Aeromonas, and Zoogloea were the most frequently occurring genera of bacteria from the lake, whereas Flavobacterium, Achromobacter, and Pseudomonas were the most common bacteria isolated from laboratory blue-green cultures. Nutritional and physiological characteristics of bacteria isolated in the laboratory were more uniform than those isolated from the lake. (Knapp-USGS)
W74-13182

ENVIRONMENTAL LEAD: A SURVEY OF ITS POSSIBLE PHYSIOLOGICAL SIGNIFICANCE,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W74-13233

DRINKING WATER AS A SOURCE OF LEAD POLLUTION,
Glasgow Univ. (Scotland). Dept. of Materia Medica.
For primary bibliographic entry see Field 5B.
W74-13234

RAPID METHODS FOR THE DETERMINATION OF FAECAL CONTAMINATION IN OYSTERS,
New South Wales Univ., Kensington (Australia). Dept. of Food Technology.
For primary bibliographic entry see Field 5A.
W74-13238

RADIONUCLIDE UPTAKE BY SOME FRESHWATER HYDROBIONTS, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
For primary bibliographic entry see Field 5B.
W74-13240

TEMPERATURE-TOXICITY MODEL FOR OIL REFINERY WASTE,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5B.
W74-13264

VIRUSES--WHAT IS THEIR SIGNIFICANCE IN WATER SUPPLIES,
Environmental Protection Agency, Boston, Mass. Region I.
F. B. Taylor.
Journal of the American Water Works Association, Vol 66, No 5, p 306-311, May, 1974. 3 tab, 11 ref.

Descriptors: *Viruses, *Public health, *Potable water, *Water supply, Safety, Water pollution control, Water pollution effects, *Water treatment.
Identifiers: Public relations, Virus detection.

The attitude toward the safety and significance of viruses in water supplies has changed over the last few years in both public and water treatment areas. How to protect and inform the public without producing unneccessary scares is the subject of this article. It is concluded that research is needed in the fields of virus detection methodology and dpidemiological techniques for detecting viral disease in the general population. Also, the water utility and public health professions must be careful to avoid an attitude of either complacency or doom concerning the entire issue of virus detection. (Sandoski-FIRL)
W74-13272

EFFECTS OF INTRACELLULAR NUTRIENT POOLS ON GROWTH DYNAMICS OF PHYTOPLANKTON,
Utah Water Research Lab., Logan.
W. J. Grenney, D. A. Bella, and H. C. Curl.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1751-1760, July, 1974. 7 fig, 2 tab, 33 ref.

Descriptors: *Mathematical models, *Model studies, *Phytoplankton, Simulation analysis, Data collections, Aquatic populations, Nitrogen, *Nutrient requirements, *Growth rates.

A three-compartment mathematical model has been developed to represent a phytoplankton population having the capacity to store nitrogen in a nitrate-limited environment. Parameters were estimated by fitting the model to equilibrium data from two chemostat experiments. The model then was run to simulate the transient chemostat conditions and the model response was compared with the observed data. The model is shown to provide a reasonable representation of the sudden population surges associated with intracellular nutrient storage. (Sandoski-FIRL)
W74-13302

LEVELS OF MIREX AND SOME OTHER ORGANOCHLORINE RESIDUES IN SEAFOOD FROM ATLANTIC AND GULF COASTAL STATES,
Pacific Northwest Forest and Range Experiment Station, Corvallis, Oreg. Forestry Sciences Lab.
For primary bibliographic entry see Field 5A.
W74-13315

POLLUTION OF A STORAGE RESERVOIR BY ROOSTING GULLS,
Public Health Lab. Service, Leeds (England).
For primary bibliographic entry see Field 5D.
W74-13316

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
P. W. Borthwick, G. H. Cook, and J. M. Patrick, Jr.
Pesticides Monitoring Journal, Vol 7, No 3/7, March, 1974. 3 ref.
Identifiers: *White catfish, Blue crabs.

In June 1972, a collection was taken of estuarine sediments, crabs, shrimps, and fishes, two years after aerial applications of mirex bait for controlling fire ants in coastal regions near Charleston, South Carolina. Previous monitoring (October 1969 to June 1971) determined levels of mirex in animal samples as: crabs, 0-0.60 ppm; shrimps, 0-1.3 ppm; and fishes, 0-0.82 ppm. Mirex was recently shown present in three species of fish (white catfish, 0.021 ppm; blue-gill, 0.047 ppm; carp 0.12 ppm) and blue crabs (0.026 ppm) at fresh water stations. There was no mirex detected in 36 other species examined taken from nine saline stations in the estuaries after a period of restricted pesticide use. No mirex was found at the bottom sediment samples. (Leibowitz-FIRL)
W74-13317

LEAD AND CADMIUM CONTENT OF SELECTED OREGON GROUNDFISH,
Oregon State Univ., Astoria. Seafoods Lab.
E. A. Childs, and J. N. Gaffke.
Journal of Food Science, Vol 39, No 4, p 853-854, July/August, 1974. 1 tab, 12 ref.

Descriptors: *Dietary effects, *Fish, *Lead, *Cadmium, Toxicity, Spectrophotometry, Metals, Analytical techniques, Sampling, *Oregon, Water pollution effects.
Identifiers: Groundfish.

An experimental study was undertaken to determine the lead and cadmium content of selected groundfish in Oregon. Samples were obtained from commercial fishing processors. The amounts of Pb and Cd were measured by atomic absorption

spectrophotometry following extraction of the metals into 2-pentanone. The lead content was in most cases less than 0.20 ppm; Cd was less than 0.10 ppm. These data were in the general range of Pb and Cd for canned fruit and vegetables and indicate that Oregon groundfish would nde a large proportion of lead or cadmium in a diet. (Prague-FIRL)
W74-13318

ACCUMULATION OF DIETARY POLYCHLORINATED BIPHENYLS (AROCLOR 1254) BY RAINBOW TROUT (SALMO GAIRDNERI),
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
A. J. Lieb, D. D. Bills, and R. O. Sinnhuber.
Journal of Agricultural Food Chemistry, Vol 22, No 4, p 638-642, July/August, 1974. 6 fig, 4 tab, 26 ref.

Descriptors: *Rainbow trout, *PCB's, *Gas chromatography, *Dietary effects, Aquatic life, Toxicity, Pollutant dientification, Waste water treatment.

The accumulation of PCB's (Aroclor 1254) by a Mount Shasta strain of rainbow trout (Salmo gairdneri) from a dietary level of 15 ppm was determined. Instrumentation included a gas chromatography equipped with an electron capture detector. The relative concentration (parts per million) of PCB's in the fish stabilized; absolute quantities (micrograms of PCB/fish) increased as the fish grew. The total retention of PCB's from the diet was 68 percent for a 32-week feeding period. The distribution of PCB's was fairly constant in the lipid portion of various tissues. Even when the fish were starved, PCB's did not appear to be eliminated from the trout after PCB exposure ceased. No mortalities were attributed to PCB toxicity. (Prague-FIRL)
W74-13321

SOME EFFECTS OF TURBULENCE AND LIGHT ON COMPETITION BETWEEN TWO SPECIES OF PHYTOPLANKTON,
University of Southern California, Los Angeles. Allan Hancock Foundation.
G. J. Bakus.
Invest Pesq. Vol 37, No 1, p 87-99. 1973. Illus.

Descriptors: *Turbulence, *Light intensity, *Phytoplankton, Photosynthesis.
Identifiers: *Scenedesmus, *Stichococcus.

Some effects of turbulence and light were studied in laboratory populations of the freshwater phytoplankton Scenedesmus obliquus and Stichococcus sp. between April and Aug. 1971 at the Instituto de Investigaciones Pesqueras, Barcelona, Spain. Aeration of cultures enhances both specific growth rates and the final yield of cells in Stichococcus and Scenedesmus. Stichococcus alone reproduces more rapidly than does Scenedesmus alone. In combination, the final yield of cells of Stichococcus is reduced but its initial specific growth rate remains approximately the same. Neither the specific growth rate nor the final yield of cells of Scenedesmus show differences due to the presence of Stichococcus, with few exceptions. The inhibition of Stichococcus by Scenedesmus is suggested. However, the competitive advantage in the final yield of cells of Scenedesmus over Stichococcus can be reversed in the presence of a combination of turbulent water movements and decreased illumination. The importance of turbulence to phytoplankton growth (by aeration) is suggested by the fact that populations in slightly illuminated flasks had specific growth rates and final yields of cells comparable to those in fully illuminated flasks.--Copyright 1974, Biological Abstracts, Inc.
W74-13331

OBSERVATIONS ON PLANKTONIC DIATOMS IN THE LAKE-RIVER SYSTEM LAKE MJOSA-LAKE GYEREN-RIVER GLAMA, NORWAY,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 2H.
W74-13341

LARGE ECOLOGICAL ZONES OF LAKE CHAD, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad).
For primary bibliographic entry see Field 2H.
W74-13356

SURVIVAL OF SALMONELLA TYPHIMURIUM IN ARTIFICIAL AND COASTAL SEA WATER,
Rhode Island Univ., Kingston. Dept. of Microbiology.
J. J. Graham, and J. Mc N. Sieburth.
Rev Int Oceanogr Med, 29, p 5-29, 1973, Illus.
Identifiers: Carbon, Metals, Salinity, *Salmonella, *Survival, Trypticase, Organic matter, Nutrients, Sea water.

As little as 2.5 mg organic C/l as trypticase is enough to offset in the antibacterial activity of ASW(artificial sea-water). Increasing organic matter caused an increase in growth rate and final cell numbers/ml. Without nutrients, salinities of 10%, 20% and 30% had approximately the same antibacterial activity. When nutrients were added, the greater the salinity the greater was growth limitation. Distilled water, either with or without nutrients, had the same antibacterial activity as sea-water (SW) without nutrients, thus indicating a requirement for salts and trace metals for growth. Above 15C the higher temperature the greater was the antibacterial activity in unsupplemented SW and the greater the growth in supplemented SW. Unsupplemented ASW, whose 3 component solutions were autoclaved separately to avoid trace metal precipitation, showed the usual comparatively strong antibacterial activity. In vitro work supports in situ observations that of the 3 parameters studied, salinity, dissolved organic C, and trace metals; the latter has a major influence which is modified by organic C levels.--Copyright 1974, Biological Abstracts, Inc.
W74-13361

SURVIVAL RATE OF ASCARID EGGS IN THE SOIL AND SEDIMENT OF SEWAGE IN OOZE AREA IN THE VOLGOGRAD REGION, (IN RUSSIAN),
Regional Sanitary-Epidemiological Center, Volgograd (USSR).
Z. K. Drozdova, N. A. Romanenko, I. G. Lapshina, N. L. Andreeva, and N. I. Vlasova.
Med Parazitol Parazit Bolezn, Vol 42, No 2, p 146-148, 1973. English summary.
Identifiers: *Sediments, Sewage, *Ascarids, *USSR(Volgograd).

The study established that the survival time of ascarid eggs in the soil varies from: 23-29 days on the surface, up to 1 1/2 yr at a depth of 10 and 20 cm, over 2 1/2 yr at a depth of 40 and 60 cm of clean soil. In the soil contaminated with the sediment of sewage survival time was up to 1 yr at a depth of 10 and 20 cm and up to 1 1/2 yr at a depth of 40 and 60 cm in the sediment of sewage on ooze grounds survival time ranged from 1-3 mo.--Copyright 1974, Biological Abstracts, Inc.
W74-13362

EFFECT OF THE PRESENCE OF DETERGENTS IN THE WATER ON THE APPEARANCE OF LINDANE IN THE LIVER AND FAT TISSUE OF WHITE RATS, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Vilnius (USSR).
D. G. Krasilshchikov.
Gig Sanit. Vol 37, No 9, p 96-97, 1972.
Identifiers: *Alkylbenzene sulfonate, *Detergents, Fat, Hexachloran, *Lindane, Liver, Rates, Tissue, Water pollution effects.

Rats were given hexachloran (lindane), alkylbenzene sulfonate or a binary mixture of both intragastrically at 1/5 LD50. The accumulation of hexachloran in liver and fat tissue was analyzed by thin-layer chromatography. The combination of both substances tended to increase th hexachloran content in both tissues compared to administration of only hexachloran. The effect was less pronounced in rats given the same mixtures at 1/10 LD50 for 20 days. The hexachloran content in fat tissue was greater than that in the liver in both experiments. The capacity of alkylbenzene sulfonate to emulsify the pesticide may have affected resorption of hexachoran from the gastrointestinal tract into organs and tissues.--Copyright 1973, Biological Abstracts, Inc.
W74-13372

HYGIENIC STANDARDIZATION OF THE COMPONENTS OF RUBBER PRODUCTION SEWAGE IN RESERVOIR WATER, (IN RUSSIAN),
Permskii Politekhnicheskii Institut (USSR).
Ya. I. Vaisman, N. V. Zaitseva, and A. V. Mikhailov.
Gig Sanit, Vol 38, No 2, p 17-21, 1973. English summary.
Identifiers: Mouse, *Rubber, *Sewage, *Toxicity, Captax, Altax, Thiuram, Organoleptic propertikes.

Maximum allowable concentrations (MAC) of rubber production generated affluents in reservoir water were determined from organoleptic properties and in acute and chronic poisoning tests performed on mice and cats. MAC in water of sulfeneamide BT, blue dye No. 3, thiosol, mitrosophenol, and indotoluidine were 0.05; 10.0; 0.5; 0.15, and 1 mg/l, respectively. Organoleptic properties constitute a limiting factor for the permissible concentrations in water of captax, altax, and thiuram D.--Copyright 1973, Biological Abstracts, Inc.
W74-13373

CHARACTERISTICS OF THE ACTION OF DISTILLED DRIMKING WATER ON THE STATE OF THE GASTROINTESTINAL TRACT, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
A. I. Bokina, and V. K. Fadeeva.
Gig Sanit, Vol 38, No 2, p 93-94, 1973.
Identifiers: *Distilled water, Potable water, Kinase, Phosphatase, Gastrointestinal tract, Public health.

Gastric juice acidity tests performed in healthy subjects who consumed distilled water for 1 to 5 or more yr revealed significantly elevated frequency of hypoacidic gastric juice among such subjects (40-42%, as compared to a normal value of about 25%). No significant changes in the enterokinase and alkaline phosphatase levels in children who consumed desalinated drinking water for at least 1 yr wer noted.--Copyright 1973, Biological Abstracts, Inc.
W74-13374

DATA ON THE BIOLOGY OF SELENGI OMUL JUVENILES COREGONUS AUTUMNALIS MIGRATORIUS (GEORGI), (IN RUSSIAN),
A. A. Sorokina, and V. N. Sorokin.
Vopr Ikhtiol, Vol 12, No 4, p 704-712, Illus, 1972.
Identifiers: *Benthos, *Coregonus, Larvae, Omul, Plankton, *Selengi, *USSR(Lake Baikal), Dissolved oxygen, Carbon dioxide.

Larvae and juveniles from the lower Selengi River and adjacent portions of Lake Baikal (USSR) were investigated from 1965-1969. After downstream

migration into the Selengi, some young remained in delta waters to feed. In delta waters the growth rate was high at 1st and decreased by the end of May due to deteriorating conditions. In the shallows the pattern was reversed, with growth rates increasing from May to June to July. The intensity of feeding on zooplankton and benthos was high in all areas except for the shallows, where it was low in May. The juveniles were highly adaptable to changing environmental conditions, including substantial variations in dissolved O2 and CO2, pH, temperature and food supply.--Copyright 1973, Biological Abstracts, Inc.
W74-13376

PROBLEM OF FREE AMINO ACIDS IN FRESHWATER PLANKTON AND ITS MEDIUM, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
K. K. Yankyavichyus, S. F. Budrene, A. Y. Baranauskene, V. N. Lubyanskene, and G. Y. Yankavichyute.
Liet Tsr Moksiu Akad Darb Ser B, 2, p 3-17, 1972. English summary.
Identifiers: *Amino-acids, Lysine, Methionine, Pediastrum, Peptone, *Phormidium, *Plankton, *Scenedesmus, *Decomposition.

The decomposition of methionine, lysine and peptone was found to exert a positive effect on planktonic organism development, depending on concentration and test organism. Methionine and lysine were found to enhance growth in Scenedesmus quadricauda, Pediastrum boryanum and Phormidium uncinatum and to enhance amino acid metabolism within the cells. If the concentration of amino acids becomes too high, amino acid metabolism within cells ceases. Different aquatic habitats were found to have different amounts of free amino acids and different planktonic biomasses.--Copyright 1973, Biological Abstracts, Inc.
W74-13377

SOME HYDROBIOLOGICAL PROBLEMS OF THE GROUNDWATER ENRICHMENT AT THE BUDAPEST METROPOLITAN WATERWORKS,
Lajos Kossuth Univ., Debrecen (Hungary). Zoological Inst.
J. Szabo, G. Pusztai, G. Devai, I. Davai, and Karoly Gefferth.
Acta Biol Debrecina, 9, p 197-209, 1971(1972), Illus.
Identifiers: Metropolitan waterwords, *Eutrophication, *Hungary(Budapest), *Municipal waters.

Hydrobiological and hydrochemical processes occurring in settling and percolating basins of the Budapest Municipal Waterworks (Hungary) were studied with special regard to the formation of algal blooms. Considerable differences between the 2 basins regarding their hydrochemical and hydrobiological properties were determined. The sealing of percolating basins was caused by the formation, on the bottom of the basin, of a coherent algal vegetation and by the accumulation and settling of inorganic and organic materials, which thus became enbedded in the algal layer.--Copyright 1973, Biological Abstracts, Inc.
W74-13383

STUDY OF NORMAL MICROFLORA OF BREAM (ABRAMIS BRAMA) OF THE VOLGA-CASPIAN REGION, (IN RUSSIAN),
L. A. Zubkova.
Tr Kasp Nauchno-Issled Inst Rybn Khoz, 26, p 257-260, 1971.
Identifiers: Abramis, *Bream, Flora, Microorganism, *USSR(Volga River), *Fish diseases.

The epizootic situation has become complicated considerably in the past 3-4 yr in the Volga delta and North Caspian, USSR. Fishes with 'ulcerous' lesions are found frequently in commercial catches. The material was collected in region of Ryulenii and Rakushechnyi islands (North Caspian) and in the Volga river in the region of the Muzhich'ya fishery. Twenty-eight species of microorganisms, gram-positive and gram-negative in equal numbers, were isolated from the blood and organs of the bream. Withe the exception of 2 conditionally pathogenic species, the isolated microflora is characterized mainly by saprophytes. The isolated conditionally pathogenic species can cause disease when the fishes are weakened by unfavorable environmental conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-13390

NEW CASES OF MASSIVE DEVELOPMENT OF PRYMNESIUM PARVUM CART, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kherson (USSR).
G. P. Krasnoshchek, L. S. Abramovich, and V. R. Shemchuk.
Gidrobiol Zh Vol 8, No 5, p 99-100. 1972.
Identifiers: *Fish ponds, *Prymnesium.

The massive development of Prymnesium parvum was noted in fishponds geographically remote from one another with different water supplies (atmospheric precipitation and discharge waters from rice fields). Therefore its appearance can be expected in other ponds whose water contains less than 500-600 mg Cl/liter.--Copyright 1973, Biological Abstracts, Inc.
W74-13391

RATE OF SULFATE REDUCTION IN MUD DEPOSITS OF PONDS OF THE 'KARAMET-NIYAZ' FISH FARM, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
O. I. Bogdanovich.
Gidrobiol Zh. Vol 8, No 5, p 79-82. 1972.
Identifiers: Bacteria, Carp, Oxygen, Ponds, Rate, *Sulfates, *Fish farms, Fish kills, USSR.

The ponds of the 'Karamet-Niyaz' fish farm (USSR) had a high rate of sulfate reduction, which was indicated by the high number of sulfate-reducing bacteria and content of sulfides and H2S in the mud deposits. This situation is especially threatening for the fishes in the sense of fish kills due to lack of O2 in the summer and fall months.--Copyright 1973, Biological Abstracts, Inc.
W74-13392

PARASITES OF YOUNG SILVER CARP HYPOPHTHALMICHTHYS MOLITRIX (VAL.) AND GRASS CARP CTENOPHARYN-GODON IDELLA (VAL.) IN THE AMUR RIVER, (IN RUSSIAN),
S. S. Yukhimenko.
Izv Tikhookean Nauchno-Issled Inst Rybn Khoz Okeanogr. 77 p 151-159. 1972.
Identifiers: *Carp, Ctenopharyngodon, Hypophthalmichthys, Thelohanellus, Trichodina, *USSR(Amur River), *Fish parasites.

Complete parasitological autopsy was used to investigate 575 species of uneven-aged young silver carp and 167 specimens of yound grass carp caught in the central and lower reaches of the Amus, USSR. Species (34) of parasites were found in the silver carp and 20 spp. in the grass carp. The eggs and free embryos of the silver and grass carp with a body length to 7.0-7.3 mm are free of parasites. When the embryos reach a body length of more than 7.5 mm they are infected by parasites whose quantitative and qualitative composition varies with the age of the fish. Pathogenic parasites as Thelohanellus oculileucisci and Trichodina nobilis are found in fishes of young age groups.--Copyright 1973, Biological Abstracts, Inc.
W74-13395

INFECTION OF FISH WITH OPISTHORCHIS FELINEUS IN WATER BODIES OF THE VORONEZH REGION, (IN RUSSIAN),
Voronezhskii Meditsinskii Institut (USSR). Dept. of Biology and General Genetics.
N. I. Krasilnikova.
Med Parazitol Parazit Bolezn. Vol 42, No 2, p 226-227. 1973, English summary.
Identifiers: *Opisthorchis, Felineus, *Fish parasites, *USSR(Voronezh region).

Fish from water bodies of Voronezh region, USSR, are infested with O. felineus larvae. Among 561 specimens of fish examined 264 were carriers of metacercaria of Opisthorchis (47.05%). The species of metacercaria was determined morphologically and experimentally by inoculation into experimental animals.--Copyright 1973, Biological Abstracts, Inc.
W74-13396

ICHTHYOPHTHIRIUS MULTIFILIS (FOUQUET) IN THE MIRROR CARP, CYPRINUS CARPIO L.: I. COURSE OF INFECTION,
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station.
R. S. Hines, and D. T. Spira.
J Fish Biol. Vol 5, No 3, p 385-392. 1973, Illus.
Identifiers: *Carp, *Ichthyophthirius, *Fish parasite.

Mirror carp were infected with I. multifiliis under standardized conditions. The size and number of parasites at selected sites on the body were recorded during the course of the infection. Initial exposire to 40 mature parasites resulted in a mild infection with 100% recovery after 18 days. Recovered fish did not appear to be carriers of the parasite. Exposure to 400 parasites resulted in 100% mortaility between 22-25 days. The growth rate of the parasite was linear. Parasites were more numerous in the dorsal surface of the fish than in the lateral or ventral surface. The increase in parasite numbers during the disease was greater in the gills than in the skin.--Copyright 1973, Biological Abstracts, Inc.
W74-13397

LEPTOSPIROSIS IN A RURAL SURROUNDING: EPIDEMIOLOGICAL AND PROFESSIONAL ASPECTS AMONG FARMERS (IN FRENCH),
Institut Pasteur, Paris (France). Laboratoire des Leptospires.
M. Mailloux.
Rev Epidemiol Med Soc Sante Publique. Vol 21, No 1, p 65-77. 1973. Illus. (English summary).
Identifiers: *Leptospirosis, *Human diseases, Farmers, Guadeloupe, *Leptospira, Vectors(Biological).

Farmers are likely to contract leptospirosis, a world-wide zoonosis. The organisms are transmitted through water to domestic animals by wild animals, the main reservoir hosts. Farmers and stock-breeders are frequently and repeatedly in contact with animals and water, mud..., which accounts for the multiplicity of cases occurring in rural areas. In France, Leptospira icterohaemorrhagiae represents 1/3 of the reported cases; L. pomona and L. australis respectively 13% and 10%. L. grippotyphosa is found with a frequency of 14.5 instead of 29.5 (general statistics). While most cases of leptospirosis, 80%, are due to water, in rural populations 21% only are infected from water or mud, 53% from animals, and 1/4 from both main factors involved (water and animals). As for the geographical distribution of agricultural leptospirosis in France, various foci can be localized: Ile-de-France, Anjou, the district of Toulouse, the lower part of the Rhone Valley and Bouches-du-Rhone--where L. canicola is prominent, Bourgogne and Lorraine. L. icterohaemorrhagiae is spread throughout the whole country. Overseas, in Martinique and Guadeloupe,

leptospirosis are only contracted by rural populations; the same applies to Reunion Island. The severity of infection depends on the particular susceptibility and antecedents of the patient. In Morocco, farmer, washerwomen are liable to infection from the irrigation canals. In France, L. icterohaemorrhagiae, L. pomonae and L. tarassovi leptospirosis are recognized as professional diseases by agricultural regulations.--Copyright 1973, Biological Abstracts, Inc.
W74-13399

EFFECT OF URBAN SEWAGE ON THE SANITARY AND BIOLOGICAL REGIME OF THE LOPAN RIVER (IN RUSSIAN),
Kharkov State Univ. (USSR).
T. V. Dogadina, and N. A. Chukhlebova.
Gidrobiol Zh. Vol 8, No 5, p 93-97. 1972. Illus.
Identifiers: Urban, *USSR(Lopan River), *Sewage effluents, Waste waters.

During the past 45 yr the sanitary state of the river has deteriorated considerably, evidenced by increased total water mineralization and concentration of organic matter, deterioration of the O2 regime, and increase of the total bacterial contamination of the river water. The constant entry of new pollutants into the river caused a change of the species composition of algae. The waste waters being discharged into the river from the Kharkov (USSR) plant under high pressure and at high speeds have an adverse effect on the sanitary and biological regime, which also has a deleterious effect on the qualitative composition of algae. The discharge of sewage generally exceeds the self-purifying capacity of the river.--Copyright 1973, Biological Abstracts, Inc.
W74-13401

THE KINETICS OF INORGANIC CARBON-LIMITED ALGAL GROWTH,
Missouri Univ., Columbia.
D. L. King, and J. T. Novak.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1812-1816, July, 1974. 5 fig, 5 ref.

Descriptors: *Chlorophyta, Carbon dioxide, *Photosynthesis, Carbon cycle, *Growth rates, Water analysis, Data collections, *Kinetics, Water pollution effects.
Identifiers: Selenastrum capricornutum, Scenedesmus quadricauda.

It is indicated through recalculation and recasting of previously presented data that Selenastrum capricornutum and Scenedesmus quadricauda, two green algae, both respond in a kinetic fashion to the free carbon dioxide concentration of a water for their photosynthetic carbon source. Also, their specific growth rate is not related directly to the total inorganic carbon content of the water. (Sandoski-FIRL)
W74-13410

STUDIES ON GULL LAKE, MICHIGAN: II. EUTROPHICATION: EVIDENCE AND PROGNOSIS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
B. Moss.
Freshwater Biol. Vol 2, No 4, p 309-320, 1972. Illus.

Descriptors: *Algae, *Diatoms, Growth rates, Nutrients, Phosphates, *Eutrophication.
Identifiers: Gull Lake(Michigan).

Evidence is presented, from studies on deoxygenation of the hypolimnion and from examination of the diatom frustules in a surface mud core, that Gull Lake (Michigan, USA) is becoming progressively more fertile. This appears to be a recent phenomenon, having begun in the last century. Phosphate is identified, from bioassay experiments, as the key nutrient limiting to algal growth. Probably future changes in the lake are discussed, and the existence of 'natural' eutrophication is denied.--Copyright 1973, Biological Abstracts, Inc.
W74-13456

MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA, PART II. BIOLOGICAL INVESTIGATIONS.
For primary bibliographic entry see Field 5B.
W74-13461

OBSERVATIONS ON THE HYDROLOGY AND MARINE ORGANISMS OF THE TIDAL COLORADO RIVER AND ADJACENT WATERS, TEXAS, FEBRUARY-JUNE 1962,
National Marine Fisheries Service, Galveston, Tex. Biological Lab.
For primary bibliographic entry see Field 5B.
W74-13463

BREEDING CALANOIDA AND CYCLOPOIDA (COPEPODA, CRUSTACEA) IN THE WATERS OF THE GUAMA, CAPIM AND TOCANTINS REGIONS, WITH A NOTE ON THE ACCOMPANYING FAUNA, (IN PORTUGESE),
Instituto de Pesca, Parque Fernando Costa, Sao Paulo (Brazil).
M. N. Cipolli, and M. A. J. De Carvalho.
Pap Avulsos Zool (Sao Paulo). Vol 27, No 8, p 95-110, 1973.

Descriptors: Rivers, *South America, Algae, Zooplankton, *Aquatic life, Crustaceans, Rotifers, Protozoa, Larvae, Pollutants, Water pollution, Aquatic microbiology, Aquatic insects.
Identifiers: *Brazil, *Calanoida, Capim, Cladocera, Copepoda, Crustacea, *Cyclopoida, Diaptomus-coronatus, Diaptomus-henseni, Diaptomus-iheringi, Diaptomus-jatobensis, Ectocyclops-rubescens, *Guama, Halicyclops-venezuelaensis, Mesocyclops- brasilianus, Mesocyclops-longisetus, Microcyclops-varicans, Oithona-gessneri, Pseudodiaptomus-gracilis, Pseudodiaptomus-richardi, Pseudodiaptomus-sp, Tocantins, Tropocyclops-sp.

With a 78 micro meshed net quantitative vertical and horizontal and qualitative samples of zooplankton in black, white and clear waters were collected in the reqion of the rivers Guama, Capim and Tocantins (Brazil), during the 'Expedicao Permanente da Amazonia', in Aug. and Sept. 1970. The region of the Capim River where most (77.7%) of the visited tributaries contain black water, is poorer in zooplankton than the Tocantins River region where only 10% of the tributaries are of the black water type and 40% contain white water. In the white (clayish) waters (pH around 7) the greatest variety of animal life occurs: the crustaceans (Copepoda and Cladocera) predominate, and the rotifers are 2nd in abundance and frequency. In the transparent (pH about 6) waters, in order of decreasing abundance, are the crustaceans, the colonial ciliates, the rotifers and veliger larvae. In black waters (dark, transparent waters with pH under 5) life is scarce, chiefly represented by insect larvae. Calanoida and Cyclopoida planktonic copepods found in the region were: Pseudodiaptomus gracilis, P. richardi, Pseudodiaptomus sp., Diaptomus henseni, D. iheringi, D. jatobensis, D. coronatus, Oithona gessneri, Halicyclops venezuelaensis, Ectocyclops rubescens, Tropocyclops sp., Microcyclops varicans, Mesocyclops brasilianus, M. longisetus. Of these Pseudodiaptomus and Oithona were only found in freshwater regions where the tide phenomenon was felt and in brackish water. The greatest abundance of Diaptomus was observed in lakes. Mesocyclops brasilianus only occurs in nontidal waters. D. henseni was the dominant species of Diaptomus. Oithona gessneri was the most abundant and frequent cyclopoid. The next most frequent cyclopoid was Microcyclops v. varicans.--Copyright 1974, Biological Abstracts, Inc.
W74-13465

RECIPROCAL INFLUENCE OF LARGE RESERVOIRS AND ADJACENT TERRITORIES IN DIFFERENT NATURAL CONDITIONS OF THE USSR,
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
S. L. Vendrov.
Int Rev Gesamten Hydrobiol. Vol 58, No 2, p 269-272, 1973.

Descriptors: *Reservoirs, *Eutrophication, Reservoir silting, Climate.
Identifiers: USSR.

The influences of reservoirs of various sizes and depths in different climatic regions on the climate, ground water, economy, etc. is reviewed for Soviet reservoirs. There are favorable and unfavorable results. The effects of man and other environmental factors on reservoirs are also considered; in particular, siltation rates, eutrophication from sewage effluents, etc.--Copyright 1974, Biological Abstracts, Inc.
W74-13466

DISTRIBUTION OF THE FIDDLER CRABS, UCA PUGNAX AND UCA MINAX, IN RELATION TO SALINITY IN DELAWARE RIVERS,
Millersville State Coll., Pa. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W74-13468

AN ECOLOGICAL SURVEY OF THE ALGAE OF HUNTINGTON CANYON, UTAH,
Brigham Young Univ., Provo, Utah. Dept. of Botany and Range Science.
L. E. Squires, S. R. Rushforth, and C. J. Endsley.
Brigham Young Univ Sci Bull Biol Ser. Vol 18, No 2, p 1-87, 1973. Illus.

Descriptors: *Utah, *Algae, Periphyton, Plankton, Nannoplankton, *Diatoms, Cyanophyta, Chrysophyta, Chara, Streams, Natural streams, Ecology.
Identifiers: Chara-vulgaris, Cladophora-glomerata, Hydrurus-foetidus, Oedogonium-sp, Mountain streams.

A quantitative and ecological study of the algae of Huntington Canyon, Emery County, Utah, was conducted from March 1971-April 1972. Net plankton, nannoplankton, periphyton, and visible attached algae were studied. Certain physical and chemical parameters in the waters of Huntington Creek and a small pond along its course were also measured. Huntington Creek contains a wide diversity of genera and species of algae. Diatoms are the main constituent of the flora of this stream throughout the year. Hydrurus foetidus is prevalent in Huntington Creek from late winter to early summer, and filamentous blue green algae abound in the summer and fall. Cladophora glomerata, Oedogonium sp. and Chara vulgaris are abundant in the creek beyond the mouth of the canyon. Most plankton in Huntington Creek originate on the substrate and in reservoirs on the left fork. Huntington Creek is a cold, fastflowing, hardwater mountain stream, and the algal flora of this creek is typical of such a habitat.--Copyright 1974, Biological Abstracts, Inc.
W74-13469

INVESTIGATIONS ON THE CATION-CONTENT IN A BOG: I. DIFFERENCES IN THE VEGETATION-COMPLEXES, (IN GERMAN),
Frankfurt Univ. (West Germany). Botanical Inst.
For primary bibliographic entry see Field 2H.
W74-13470

INVESTIGATIONS ON THE CATION-CONTENT IN A BOG: II. SEASONAL CHANGES

AND INFLUENCE OF THE SPHAGNUM VEGETATION, (IN GERMAN),
Frankfurt Univ., (West Germany). Botanical Inst.
For primary bibliographic entry see Field 2H.
W74-13471

LIMNOLOGICAL ASPECTS OF SOME MOROCCON ATLAS LAKES, WITH REFERENCE TO SOME PHYSICAL AND CHEMICAL VARIABLES, THE NATURE AND DISTRIBUTION OF THE PHYTO- AND ZOOPLANKTON, INCLUDING A NOTE ON POSSIBILITIES FOR THE DEVELOPMENT OF AN INLAND FISHERY,
Ghent Rijksuniversiteit (Belgium). Zoology Inst.
H. J. Dumont, M. Ionel, U. Dall'asta, W. Decraemer, and C. Claus.
Int Rev Gesamten Hydrobiol. Vol 58, No 1, p 33-60. 1973, Illus.

Descriptors: *Lakes, *Phytoplankton, *Zooplankton, Limnology, *Eutrophication, Water pollution effects.
Identifiers: Ifni Lake(Morocco), *Morocco.

Four mountain lakes were studied. Two are eutrophic, 1 is mesotrophic and 1 is oligotrophic. The 1st 3 have a well-developed phyto- and zooplankton, with a relatively high diversity index. There are differences between the faunas that may be ascribed to differences in surface, depth, altitude and to biological phenomena such as interspecific competition. Ifni Lake is a high-mountain lake, subject to severe environmental conditions. It has a very simple food chain; there is only 1 sp. of algae, an unicellular blue-green, 1 copepod species, 1 rotifer and 1 fish. In general, some features of definite interest for fundamental limnology were found: the presence of a pelagic Rhabdocoelid in Dayat Ifrah, some particularities in the vertical distribution of a number of plankton species and the existence of a layer of relatively warm water near the bottom of Lake Ifni. The latter is explained by a strong bottom current which flows through the lake between its phreatic in- and outlets. Stress is laid on the under-exploitation of Moroccan inland waters with respect to a freshwater fishery.--Copyright 1974, Biological Abstracts, Inc.
W74-13476

RESEARCH ON THE INFLUENCE OF HEAVY METALS ON THE DEVELOPMENT OF SCENEDESMUS QUADRICAUDA (TURP) BREB. PART I MERCURY,
Water Economics Research Inst., Wroclaw (Poland). Water Protection Research Section.
E. Rzewuska, and A. Wernikowska-Ukleja.
Polskie Archiwum Hydrobiologie, Vol 21, No 1, p 109-117, 1974. 5 fig, 11 ref.

Descriptors: *Mercury, *Toxicity, *Algae, Water quality, Heavy metals, Metals, Water pollution sources, Inhibitors, Enzymes, Proteins, Biochemistry, Photosynthesis, Plankton, Laboratory tests, Bioassay, Mortality, Lethal limit, Methodology, Growth rate, Oxygen, Analytical techniques, Primary productivity.
Identifiers: *Scenedesmus quadricauta, *Mercury ions.

In the investigations of the effect of mercury salt (Hg(NO3)2, Hg(C12) on the growth of Scenedesmus quadricauda, the increase of the quantity of organisms and intensity photosynthesis was used as a criterion of toxic effect. As the criterions adopted for evaluation did not tally with each other, an additional criterion was applied, namely the value of the coefficient obtained from the proportion of the size of assimilation processes to the respiration and decay processes in the tests with specified salt concentrations. (Katz)
W74-13477

COMPARATIVE STUDIES ON THE DETERMINATION OF TOXICITY OF SOME PESTICIDES,
Silesian Technical Univ., Gliwice (Poland). Inst. of Environmental Protection Engineering.
M. Zdybiewska, and K. Kluczycka.
Polskie Archiwum Hydrobiologi, Vol 21, No 1, p 179-190, 1974. 7 tab, 18 ref.

Descriptors: *Methodology, *Toxicity, *Pesticides, *Biochemical oxygen demand, DDT, Bioindicators, Bioassay, Testing, Herbicides, Fungicides, Analytical techniques, Mortality, Water quality, Lethal limit, Nitrification, Microorganisms, Water pollution effects, Water purification, Biological purification.
Identifiers: *Kalabina's Test, *Paramecium caudatum, *BOD, Cupritox-50, Simazine.

The toxicities of DDT, Cupritox-50 and Simazine were investigated with the parallel use of the BOD test, the mortality test and Kalabina's method. It was established that the two latter methods allow a precise determination of the toxicity of pesticides while the BOD test does not give representative results except for the limit concentration of copper ions. (Katz)
W74-13478

ERYTHROCYTE DEGENERATION IN THE ATLANTIC HERRING, CLUPEA HARENGUS HARENGUS L.,
National Marine Fisheries Service, West Boothbay Harbor, Maine. Boothbay Harbor Lab. Northeast Fisheries Center.
S. W. Sherburne.
Fishery Bulletin, Vol 71, No 1, p 125-134, January 1973. 3 tab, 8 fig, 7 ref.

Descriptors: *Herrings, *Cytological studies, *Temperature, *Fish physiology, *Fish diseases, Biology, Stress, Commercial fish, Methodology, Microscopy.
Identifiers: *Erythrocytes, Clupea harengus, Cytoplasmic inclusions, Hematocrit, Red blood cells, Blood, Cell morphology.

Cytoplasmic inclusions, associated with erythrocyte degeneration were found in the circulating blood of herring from Boothbay Harbor, Maine, and from Passamaquaddy Bay at Deer Island, N.B., Canada, in 1969. Except in one instance, when inclusions occurred in herring from water at 2 degrees C., all herring from Boothbay Harbor having inclusions were taken from seawater at 13.8 degrees or above. A relationship appears to exist between inclusion in herring erythrocytes and stress factors, especially temperature extremes. At 16 degrees C., 96% of a sample of herring were affected with inclusions, had the highest number of inclusions of all herring sampled, and had markedly different blood morphology. Inclusions were found in the Passamaquaddy Bay area in 2 of the 50 herring sampled from a seawater temperature of 9.8 degrees C., the highest temperature sampled in that area. Inclusions rarely occurred more than one to a red cell and varied in size from 1.3 to 3.9 microns. In herring containing a high incidence of inclusions, the larger inclusions were usually in the youngest red cells. Either an abnormally high percentage of up to 90% immature red cells or a low of 1 to 5% red cells generally characterized herring containing inclusions. (Katz)
W74-13479

LONG-TERM OLFACTORY 'MEMORY' IN COHO SALMON, ONCORHYNCHUS KISUTCH,
National Marine Fisheries Service, Honolulu, Hawaii. Southwest Fisheries Center.
A. E. Dizon, R. M. Horrall, and A. D. Husler.
Fishery Bulletin, Vol 71, No 1, p 315-317. January 1973. 1 tab, 12 ref.

Descriptors: *Salmon, *Anadramous fish, *Fish migration, Juvenile fish, Laboratory tests, Smolt, Life cycles, Salmonids, Fish behavior, Salinity.
Identifiers: *Coho salmon, *Oncorhynchus kistuch, *Homing, *Olfactory(Memory), Imprinting, Morpholine, EEG responses.

Coho salmon smolts were exposed to a synthetic odoriferous substance, morpholine, for one month and then removed from any conceivable influence of this substance for ten months. At this time there fish and controls were examined for olfactory bulbar EEG responses to the imprinting substance. It is indicated that 'memory' was dependent on exposure to morpholine during one of the critical periods in the life of the fish. Fish were treated at very low concentrations of morpholine, but EEG responses were not evident until 100 ppm was reached in responsive fish. (Katz)
W74-13480

THE TOXICITY OF SOME DETERGENTS TESTED ON AEDES AEGYPTI L., LEBISTES RETICULATUS PETERS, AND BIOMPHALARIA GLABRATA (SAY),
Royal Tropical Inst., Amsterdam (Netherlands). Inst. of Tropical Hygiene; Amsterdam Univ. (Netherlands). Lab. of Parasitology.
H. M. van Emden, C. C. M. Kroon, E. N. Schoeman, and H. A. van Seventer.
Environmental Pollution, Vol 6, No 4, p 297-308, June 1974. 2 fig, 7 tab, 9 ref.

Descriptors: *Toxicity, *Detergents, *Anions, *Mosquitos, *Snails, Surfactants, Biodegradation, Aquatic life, Larvae, Bioassay, Mode of action, Alkylbenzene, Sulfonates, Lethal limit.
Identifiers: *Guppies, *Aedes aegypti, *Lebistes reticulatus, *Non-ionic detergents, Biomphalaria glabrata, Gills.

Toxicities of different concentrations of anionic and non-ionic commercial detergents and biodegradation products of these detergents were tested on a mosquito, Aedes aegypti, the guppy, Lebistes reticulatus, and the snail, Biomphalaria glabrata. The mosquito larvae were more sensitive to anionic than non-ionic detergents. The mode of action of the detergents was determined as was the most sensitive stage of development. Lebistes reticulatus showed irreversible damage of the epithelium of the gills by anionic, as well as long chained non-ionics, and a reversible paralyzing effect with short (and branched) non-ionic detergents. The snail was equally susceptible to both types of detergents. Biodegradation products of 1000 ppm detergent had no influence on the mortality of the three tested animals. (Katz)
W74-13481

OLFACTORY RESPONSE AND FENITROTHION TOXICITY IN AMERICAN LOBSTERS (HOMARUS AMERICANUS),
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
D. W. McLeese.
Journal of the Fisheries Research Board of Canada, Vol 31, No 6, p 1127-1131, June 1974. 3 tab, 2 fig, 14 ref.

Descriptors: *Lobsters, *Toxicity, *Pesticides, Commercial shellfish, Invertebrates, Organophosphorous pesticides, Bioassay, Larvae, Methodology, Lethal limit.
Identifiers: *Homarus americanus, *Olfactory response, *Fenitrothion, *Chemo reception, LC50, LT50.

In test runways, the olfactory response of American lobsters (Homarus americanus) to cod muscle extract is not affected by simultaneous presentation of fenitrothion at measured concentrations ranging from 0.05 to 25.4 ppb at time of stimulation. Larval and adult lobsters have similar sensitivity to fenitrothion. For both, the 96-hour LC50 is about 1ppb. The lethal threshold for larvae is about 0.015ppb, that for adults is 0.3 ppb or lower. (Katz)
W74-13483

CHRONIC TOXICITY OF NICKEL TO THE FATHEAD MINNOW,
National Water Quality Lab., Cincinnati, Ohio. Newtown Fish Toxicology Lab.
Q. H. Pickering.
Journal Water Pollution Control Federation, Vol 46, No 4, p 760-765, April 1974. 5 tab, 21 ref.

Descriptors: *Nickel, *Bioassay, *Toxicity, *Standards, Minnows, Bioindicators, Resistance, Growth rate, Reproduction, Water quality control, Spawning, Heavy metals, Hydrogen ion concentration, Laboratory tests, Methodology.
Identifiers: *MATC, *TL50, Pimephales promelas, Chronic bioassays.

The chronic toxicity of nickel to fathead minnows was determined and acute toxicity data for use in calculating an application factor was obtained. The criteria for toxicity were the effects on survival, growth, and reproduction. The application factor was estimated by using the maximum acceptable toxicant concentration (MATC) of the chronic test and the 96 hr TL50 of the acute toxicity bioassay. Data indicate that nickel concentrations of 0.38 mg/l and lower do not adversely affect survival, growth and reproduction of the fathead minnow and concentrations of 0.73 mg/l caused a significant reduction on both the number of eggs per spawning and the hatchability of these eggs. (Katz)
W74-13485

AMMONIA TOXICITY LEVELS AND NITRATE TOLERANCE OF CHANNEL CATFISH,
Caterpillar Tractor Co., Peoria, Ill.
G. L. Knepp, and G. F. Arkin.
The Progressive Fish-Culturist, Vol 35, No 4, p 221-224, October 1973. 2 fig, 5 ref.

Descriptors: *Channel catfish, *Ammonia, *Toxicity, *Bass, *Nitrates, *Fish farming, Resistance, Water pollution sources, Commercial fish, Fish management, Lethal limit, Bioassay, Filters, Filtration, Water purification, Water quality, Behavior, Fish toxins.
Identifiers: *Ictalurus puctatus, *Micropterus salmoides, LC50.

Ammonia toxicity levels and nitrate tolerance are important factors in effective channel catfish farming. The results of this investigation indicate that the LC100 value for total ammonia is 45.7 and the LC50 is 37.5ppm. Observations of nitrate concentrations for channel catfish and large mouth bass (Micropterus salmoides) indicate tolerance as high as 400 ppm. First symptom levels, such as the concentration values of total ammonia when fish go off feed (30 ppm) are seemingly more important to closed-system fish farmers. Recovery from higher levels than this indicate tolerance for short periods of time. (Katz)
W74-13486

A CRITICAL STUDY OF METHODS IN NUMERICAL TAXONOMY: THE CLASSIFICATION OF AQUATIC BACTERIA, (IN FRENCH),
M. Delabre, A. Bianchi, and M. Veron.
Ann Microbiol (Paris). Vol 124, No 4, p 489-506. 1973, Illus. English summary.

Descriptors: *Aquatic bacteria, *Systematics, Classification.

The present work compares 4 methods of hierarchical classification as applied to 135 aerobic heterotrophic aquatic bacteria: 98 strains chosen at random from among 440 marine strains, 12 chosen from among 40 isolated from alpine torrents, and 25 reference strains obtained from several collections. The reference strains belonged to 18 different species. For each strain, 215 phenotypic characters were determined, of which 146 were related to nutritional versatility towards 146 C substrates. For each pair of strains, the similarity was calculated by means of the simple matching coefficient, and then converted into a distance coefficient. From these data, a classification was established by 4 methods: aggregation according to minimal jump, aggregation according to minimal diameter, aggregation according to average distance, and aggregation according to variance. For the delimitation of the phenons, the maximum level of distance was chosen according to a defined criterion. In the classifications 1, 2, 3 and 4, the number of the phenons was 20, 16, 41 and 29, respectively. The 4 classifications were judged on their respective merits by the determination of coefficients of likelihood (average phenetic coefficient, intraphenetic or residual heterogeneity) and of discriminant power (interphenetic heterogeneity). Because the 2 coefficients of heterogeneity were the most accurate and useful, the classification method by aggregation according to variance is recommended.--Copyright 1974, Biological Abstracts, Inc.
W74-13487

MERCURY CONTENT OF THE MUSSELS (MYTILUS EDULIS) GROWING FREE AND UNDER CULTIVATION IN NORTHWEST SPAIN, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Cadiz (Spain). Laboratorio de Investigaciones Pesqueras.
For primary bibliographic entry see Field 5B.
W74-13493

ALGAL ASSAYS OF ARCHIPELAGO WATERS: QUANTITATIVE ASPECTS,
Lantbrukshogskolan, Uppsala (Sweden). Institutionen for Vaxtfysiologi.
L. Bjorn, P. E. Melin, and K. E. Roland.
Oikos, Vol 24, No 2, p 171-178, 1973, Illus.

Descriptors: *Algae, Harvesting, *Bioassay.
Identifiers: Aphanizomenon, Oscillatoria, *Stockholm Archipelago, *Sweden.

Eighteen surface water samples were collected during 1970 from Lake Malaren (freshwater) and to the outer part of the Stockholm Archipelago (brackish water). After filtration most samples were enriched with phosphate (P), nitrate (N) and chelated trace elements (TE), alone or in combination, and inoculated with blue-green algae, Oscillatoria Agardhii or Aphanizomenon flos-aquea, isolated from the investigated area. The algae (not free from bacteria) were cultivated under standard conditions. The dry weight at harvesting was used to evaluate the growth-stimulating effect (in comparison with unenriched controls) of the additions. The yields of O. Agardhii (the controls and those with all 3 additions) were largest 17-26 km to the east of Slussen, the Stockholm lock. During the year the smallest growth occurred during summer. The results with A. flos-aquae followed a similar distribution pattern. Regression analysis of the results with O. Agardhii showed that enrichment with TE or P, alone or together, did not stimulate growth. The addition of N, alone and in combinations with TE or P, stimulated the growth, in proportion to the growth in the unenriched water samples. The enrichment with P + N + TE gave the largest stimulation.--Copyright 1974, Biological Abstracts, Inc.
W74-13495

POTENTIAL PRODUCTIVITY OF AN ALPINE LAKE AS INDICATED BY REMOVAL AND REINTRODUCTION OF FISH,
British Columbia Univ., Vancouver. Inst. of Fisheries.
C. J. Walters, and R. E. Vincent.
Trans Am Fish Soc. Vol 102, No 4, p 675-697, 1973. Illus.

Descriptors: *Zooplankton, *Fish food organisms, Brook trout, *Colorado, *Productivity, Entrophication.
Identifiers: *Emmaline Lake(Colo).

Invertebrate population changes were traced during 1966-1968 in Emmalins Lake, Colorado, after removal in 1964 of a population of stunted brook trout. Species composition of the zooplankton changed greatly after fish removal; in the absence of fish predation, large species were dominant. Populations of mud dwelling midges increased after fish removal; in the absence of fish predation, population regulation appeared to occur through densitydependent larval mortality. Insect emergency over rocky areas was highest in the 2nd summer after fish removal, following increases in periphyton production. In 1968, the lake was restocked with yearling cutthroat trout that fed primarily on midge pupae and Daphnia middendorffiana, and doubled in weight during the 1st summer in the lake. Growth efficiency of the trout was about 10-30%. Less than half of the daily ration was present in trout stomachs at any time, as judged from observed growth rate and potential growth efficiency. A computer stimulation model of the fish production system suggested that yield and optimum management policy (stocking rate and harvest rate) are most strongly affected by the quantities of terrestrial insects available to fish. Optimum stocking rate is apprently much lower than that which would maximize total invertebrate yield to fish.--Copyright 1974, Biological Abstracts, Inc.
W74-13496

5D. Waste Treatment Processes

ECONOMICS OF INDUSTRIAL WASTE WATER SAMPLING,
N-CON Systems Co., Inc., New Rochelle, N.Y.
M. I. Beach, and J. S. Beach, Jr.
Water and Sewage Works, Reference Number, p R68-R74, April 30, 1974. 7 fig.

Descriptors: *Industrial wastes, *Sampling, *Waste identification, Testing procedures, Waste water treatment, Methodology.

Increased water quality standards and rising waste water treatment costs, make it imperative that firms be continually aware of the quality and quantity of their effluent. A variety of sampling process designs to provide such information are assessed. The initial stage in determining any sampling design is the choice of the optimal sampling site. Such a site should provide access to all pertinent effluent streams, while avoiding waste water streams which might contribute to dilution or otherwise interfere with the analysis. Often such areas are inaccessible requiring samples to be taken from many sites to derive a reasonable approximation of the actual effluent quality. Six sampling approaches characterized by their collection methods may be selected: (1) individual or grab sampling; (2) simple composite sampling; (3) sequential composite sampling; (4) continuous sampling; (5) hand proportioned composite sampling; and (6) automatically proportional composite sampling. An evaluation of each indicates that appropriate sampling techniques depend on the waste water quantity and quality and release times. Appropriate sampling equipment depends on site selection and sampling technique chosen. Several sampler pumps, cup and bucket elevator, scoops and vaccuums, are evaluated. Addition of recording and alarm devices is also discussed. (Schroeder-Wisconsin)
W74-12780

BENEFIT COST ANALYSIS OF ALTERNATIVE EXPANSION SITES FOR THE VIRGINIA KEY SEWAGE TREATMENT PLANT,
Miami Univ., Fla. Sea Grant Program.
L. G. Anderson.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-10188, $3.25 in paper copy, $2.25 in microfiche. Sea Grant Special Bulletin No 11, January 1973. 21 p, 1 fig, 2 tab, 2 ref. NOAA 2-35147.

Descriptors: *Land use, *Cost-benefit analysis, *Sewage treatment, *Facilities, Florida, Recreation facilities, Cost comparison, Discount rates, Camp sites, Land development, Beaches.
Identifiers: *Opportunity cost, Virginia Key(Fla), Dade County(Fla).

The cost effectiveness of two sites considered for expansion of Miami's Virginia Key sewage treatment plant is reviewed. The first alternative considered is a southern site that is a marshy former solid waste disposal dump. Construction cost there will be $21 million. A second site, located to the north, is more suitable for construction as well as for conversion to a recreational facility. Expansion of the sewage plant here would nearly destroy this site for water recreation use. Construction costs at this site would be about $20 million. Another site cost is the opportunity cost of land. Opportunity costs here represent the value of two recreational activities which must be foregone with the plant's extension: overnight camping and day picknicking. The net present value of benefits from each activity is evaluated under alternative discount rates for each site. In general, a comparison of results indicates that the net present value of benefits that could be generated from maintaining the north site for recreational development exceed the $1 million construction cost saving were the treatment plant extended into this area. (Schroeder-Wisconsin)
W74-12785

CHEMICAL WASTES: WHAT'S AHEAD.
Water and Wastes Engineering, Vol 9, No 5, p C4-C7, 1972. 8 tab.

Descriptors: *Chemical industry, *Waste water treatment, *Costs, Industrial wastes, Chemical wastes, Capital costs, Operating costs, Organic compounds, Inorganic compounds.
Identifiers: Inorganic chemicals industry, Organic chemicals industry.

Waste water discharge and treatment parameters are presented for the inorganic and organic chemicals industries. Contaminated waste water from the inorganic industry comes primarily from electrolysis and crystalization brines, washings from filter cakes, spend acid and alkalies, and washings from raw materials. Treatment practices vary but generally involve in-plant segragation of contaminated and uncontaminated cooling waters. Equalization, neutralization, sedimentation and lagooning processes are widely used. Average capital costs were estimated at $2,223/1000 gpd or $3.74/annual ton of production; average operating costs were estimated at $58.49/1000 gpd or $0.98 per yr/annual ton of production. Waste treatment data from 53 organic chemical plants is also summarized. Principal waste water contaminants in the organic industry effluents include BOD, COD, oil, suspended solids, acidity, heavy metals, color, taste and odor producing compounds, and residual organic products and by-products. Capital and operating costs to treat organic industrial waste water are estimated for six treatment levels over the 1969-1973 period. (Schroeder-Wisconsin)
W74-12790

APPARATUS FOR FLUID TREATMENT,
Sybron Corp., Rochester, N.Y. (assignee).
W. J. Maroney.
US Patent No 3,812,969, 4 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 922, No 4, p 1137, May 28, 1974.

Descriptors: *Patents, *Ion exchange, *Resins, *Filtration, Water treatment, *Waste water treatment, Pollution abatement, Equipment.
Identifiers: Compressed air.

The apparatus includes an outer vessel having a closed bottom and an inner vessel having an open bottom. There is an opening between the inner vessel and the bottom of the outer vessel. The bed of solid particles is supported by the bottom of the outer vessel and extends up into at least one of the vessels. The bed covers the opening between the inner vessel and the bottom of the outer vessel. An inlet conduit admits fluid to one of the vessels and the fluid passes down through the bed and through the opening into the other vessel. Since the bed is supported by the outer vessel, support paraphernalia such as underdrains and strainers are not required. At least one of the vessels has a closed top. Fluid accumulates in the vessel and a pocket of air is trapped above the accumulated fluid and is thus compressed. The bed is backwashed by reducing pressure on the inlet side of the bed, whereby the compressed air forces the accumulated fluid back through the bed and through a backwash outlet conduit. During the backwash cycle, air may be withdrawn from the pocket of compressed air and injected into the bed, so that a mixture of air and fluid will pass through the bed and scour the particles. (Sinha-OEIS)
W74-12799

AERATOR HEAD,
Saratoga Development Corp., San Diego, Calif. (assignee).
R. C. Sabins.
US Patent No 3,819,160, 3 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 923, No 4, p 1405, June 25, 1974.

Descriptors: *Patents, *Aeration, *Water treatment, *Waste water treatment, Mixing, Equipment.

The aerator head is capable of operation over a wide range of flow rates to provide effective aeration of a large volume of water by a turbulent mixing action. The same configuration can be used for gentle mixing in an aquarium, or for violent mixing in a water treatment system containing solids in suspension, such as sand. The head is a block with connections to an air supply. The block contains ducts which lead to a pair of orifices facing each other across a gap or slot. The two streams of air ejected from the orifices impinge in the slot and spread in all directions in a turbulent manner. The extent of the turbulence depends on the flow rate of air, but even at a low flow rate, the air is distributed through a considerable volume of water. (Sinha-OEIS)
W74-12800

APPARATUS FOR AUTOMATICALLY EFFECTING VACUUM CONCENTRATION AND RECOVERY OF WASTE LIQUID,
K. Takayasu.
US Patent No 3,826,718, 5 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 924, No 5, p 1303, July 30, 1974.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, *Distillation, *Water quality control, *Water pollution control, *Condensation, Evaporation, Equipment, Liquid wastes, Metals.
Identifiers: Vacuum concentration.

An evaporating vessel which is provided with a steam riser tube on its top is occupied by a vapor separator and a condenser. The condenser is subjected, through a drain tank consisting of two tanks connected in series, to vacuum. A waste liquid is supplied into the evaporating vessel and is heated by a steam heater. Steam thus produced is condensed into distilled water by the condenser and the distilled water is discharged through the drain tank to the outside. The liquid level in the evaporating vessel, water level in the drain tank and liquid level in the waste liquid recovery tank are controlled by relays arranged on a control board in a manner such that the evaporating and concentrating operations of the waste liquid and discharge of distilled water are automatically repeated for a given number of times. (Sinha-OEIS)
W74-12802

BREAKING OF OIL-IN-WATER EMULSIONS,
J. W. Schick, and D. R. Cushman.
US Patent No 3,826,725, 2 p, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 924, No 5, p 1304, July 30, 1974.

Descriptors: *Patents, *Oily water, *Emulsions, *Flocculation, Pollution abatement, *Waste water treatment, Water quality control, Water pollution control, Electrolytes, Hydrogen ion concentration.
Identifiers: Electric current, Aluminum hydroxide.

This method comprises adjusting the emulsion with an electrolyte to a pH not higher than about 4. Through the thus-adjusted emulsion, there is transmitted direct electric current in order to obtain a pH of at least about 5, whereby the emulsion is resolved into a water phase and an oil phase. The mechanism involved in the emulsion breaking procedure is dependent on the formulation of aluminum hydroxide as a floc. As the hydroxide forms first as a colloidal suspension, oil preferentially adsorbs onto the surface. This floc-preferential adsorption phenomenon appears dependent on solution pH. As the pH approaches the critical point of 5, the aluminum hydroxide colloid particles agglomerate into a visible floc and settle out. When this occurs, the major portion of the oil particles are adsorbed leaving a relatively oil-free water phase. (Sinha-OEIS)
W74-12803

METHOD FOR THE DISPOSAL OF COMBUSTIBLE AND DILUTE AQUEOUS WASTES,
Atomic Energy Commission, Washington, D.C. (assignee).
E. S. Grimmett, and P. E. Lamont.
US Patent No 3,827,946, 2 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 925, No 1, p 233, August 6, 1974.

Descriptors: *Patents, *Pollution abatement, *Evaporation, *Condensation, *Steam, Potable water, Liquid wastes, Equipment.
Identifiers: *Power production.

Fluidized-bed techniques are employed to dispose of combustible waste materials and dilute aqueous wastes and simultaneously produce useful power and potable water. Combustible trash plus any necessary conventional fuel is burned in a fluidized-bed burner which is used to generate steam. The steam thus produced is used to evaporate dilute aqueous wastes in the first stage of a fluidized-bed evaporator. The steam produced in the first stage is used to evaporate dilute aqueous wastes in the second stage of a fluidized-bed evaporator. The steam produced in the second stage is used to generate power and the spent steam from both stages of fluidized-bed evaporation is condensed as potable water. (Sinha-OEIS)
W74-12805

PLANT FOR WASTE WATER TREATMENT,
FMC Corp., Chicago, Ill. (assignee).
Q. L. Hampton, and E. J. Matras.
US Patent No 3,828,933, 6 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 925, No 2, p 495, August 13, 1974.

Descriptors: *Patents, *Waste water treatment, *Aeration, *Digestion tanks, Pollution abatement, Water pollution control, Water quality control, *Treatment facilities.
Identifiers: Settling tanks.

Apparatus for converting a unitary liquid holding tank into a series of interconnected cooperative zones, including aeration and settling zones, for activated sludge type processing of wastewater comprises a self supporting insertable modular settling tank filling only a portion of the total area of the holding tank. The modular settling tank has downward and inward extending sloping walls in

the lower portion to form an accumulation area for the settled sludge. Isolated liquid tight hollow compartments have closable ports communicating with the interior of the compartments. Gas dispersion means are supported by and positioned adjacent the exterior of the modular tank. First and second troughs are mounted within the modular tank for receiving sludge and a clarified liquid respectively to be discharged from the modular settling tank. The trough receives sludge which is delivered by the movable suspension exhaust and directs at least a part of it to the second cross-sectional segment of the holding tank. (Sinha-OEIS)
W74-12806

DEVICE FOR REMOVING FLOATED MATERIAL IN FLOTATION PROCESSES,
Degremont Societe Generale d'Epuration et d'Assainissement, Rueil-Malmaison (France). (assignee).
J-M. Rovel.
US Patent No 3,828,935, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 925, No 2, p 495, August 13, 1974.

Descriptors: *Patents, *Flotation, Pollution abatement, *Waste water treatment, Water quality control, Water pollution control, Equipment, *Separation techniques.

A device is described for removing floated materials from a body of liquid. It comprises a tank, a grillage, and a sloping overflow spout. A collector is mounted in the immediate proximity of the upper surface of the grillage. The upper portion of the floated material is moved into the overflow spout. A screw conveyor moves the floated material along the overflow spout to the outlet. (Sinha-OEIS)
W74-12807

REDUCTION OF WATER POLLUTION BY BIOLOGICAL DENITRIFICATION,
Union Oil Co. of California, Los Angeles, Calif. (assignee).
S. Hashimoto.
US Patent No 3,829,377, 5 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 925, No 2, p 604, August 13, 1974.

Descriptors: *Patents, Water purification, *Waste water treatment, *Denitrification, *Irrigation water, Methane, Drainage water, *Anaerobic conditions, Pollution abatement, Water quality control, Water pollution control, Equipment, Biological treatment.

Drain water from an irrigation system is held in a storage tank and transported to a holding tank which has a special packing to increase its available surface area. Drain water and methane gas are introduced into the bottom of the holding tank. The rain water gradually rises within the holding tank and denitrification of the nitrate ion proceeds as the water rises. A major portion of the nitrates are converted to nitrogen gas which partly dissolves in the water. Anaerobic conditions exist in the denitrification step since an oxygen-free vapor is present above the water undergoing treatment. The circulation of the hydrocarbon gas also sweeps any oxygen which may be present in the feed water from the treatment step. (Sinha-OEIS)
W74-12808

OXYGEN-HYDROGEN GENERATION AND SEWAGE TREATMENT METHOD AND SYSTEM,
R. B. Wesley.
US Patent No 3,829,368, 7 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 925, No 2, p 602, August 13, 1974.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Electrolysis, Potable water, Energy.
Identifiers: Kinetic energy, Electrical energy, Fuel cells.

A method for the regenerative treatment of sewage reaction and energy recovery comprises the following steps: pretreating the sewage to remove the majority of the solid portions; decomposing pretreated sewage into constituent gaseous elements under elevated pressure; collecting the pressurized constituent gaseous elements; converting the potential energy of the pressurized gaseous elements to kinetic energy by expanding and depressurizing gaseous elements; generating electrical energy from kinetic energy; chemically recombining the depressurized constituent elements and obtaining electrical energy and water; recycling the electrical energy to decompose additional sewage; and supplying supplemental electrical energy needed for the continuous decomposition of additional sewage. (Sinha-OEIS)
W74-12809

METHOD OF TREATING WASTE SOLUTION CONTAINING CHROMATE ION OR CYANIDE ION,
Nihon Filter Co. Ltd., Tokyo (Japan). (assignee).
T. Nakamura.
US Patent No 3,826,741, 6 p, 7 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 924, No 5, p 1307, July 30, 1974.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Metals, Hydrogen ion concentration.
Identifiers: Chromate ions, Cyanide ions, Redox potentiometers, Redox potential, *Chemical treatment.

A method of treating a waste solution containing chromate ion or cyanide ion is disclosed in which a redox potentiometer with a pH correction circuit is used for the detection of the redox potential and the pH electromotive force of the waste solution being treated. The output voltages are superposed with the pH correction circuit so that the variation of redox potential caused by the variation of pH value of the waste solution is compensated. A corrected output voltage which indicates the redox potential corresponding to a pre-set pH value of the waste solution is generated. The amount of treating chemicals being fed into the treatment ank is adjusted, by a flow regulator which is controlled in response to the corrected output voltage delivered from the pH correction circuit. (Sinha-OEIS)
W74-12810

ANALYSIS OF WATER CHARACTERISTICS OF MANUFACTURING INDUSTRIES AND THEIR ADAPTABILITY TO SEMI-ARID REGIONS,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 3E.
W74-12863

TREATMENT OF LIQUID WASTES FROM CANE SUGAR INDUSTRY,
Puerto Rico Univ., Mayaguez. Dept. of Chemical Engineering.
R. M. Candelario.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 292, $5.25 in paper copy, $2.25 in microfiche. Puerto Rico Water Resources Research Institute, Mayaguez, Completion Report, June 1974. 103 p, 36 fig, 14 tab, 37 ref. OWRT A-033-PR(1).

Descriptors: *Puerto Rico, Pilot plants, Waste identification, *Waste water treatment, *Industrial wastes, *Sugarcane, Liquid wastes, *Activated sludge, Filtration, *Trickling filters, Aeration, Activated carbon, Anaerobic digestion.

The applicability of several waste treatment processes to the purification of the waste waters generated by the cane sugar industry in Puerto Rico was studied. The specific processes considered were anaerobic digestion, activated sludge treatment, trickling filtration, oxidation using mechanically supplied air, and adsorption in activated charcoal. Pilot plant units which allowed determining the changes in efficiency brought about by changes in the variables of operation were constructed for each of the processes considered. Numerous runs were made in each of them using as raw material waste waters brought into the laboratory from different sugar mills operating in the Western part of Puerto Rico. As a first step in the study the physical and chemical parameters characterizing the wastes were evaluated. The actual volumes of effluents discharged by the mills were also determined. The results obtained show that cane sugar waste waters are amenable to treatment by each of the processes considered. In each of them efficiencies of the same order of magnitude as those corresponding to the industrial application of the same processes to other wastes were obtained. The reductions in pollution load attained were in the order of 50% for anaerobic digestion, 80% for activated sludge treatment, 75% for trickling filtration, 50% for mechanical aeration methods, and 50% for treatment with activated charcoal. Correlations were made which allow estimating the efficiency of each of these processes as a function of physical parameters of operation. The pollutional load of waste waters from the cane sugar industry may therefore be significantly reduced by using the treatment processes evaluated in this study.
W74-12865

CONFERENCE ON RECYCLING TREATED MUNICIPAL WASTEWATER THROUGH FOREST AND CROPLAND.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
Copy Available from GPO Sup Doc as EP1.23:660/2-74-003, $1.20; microfiche from NTIS, Springfield, Va 22161 as PB-236 313, $2.25 in microfiche. Environmental Protection Agency, Technology Series, Report EPA-660/2-74-003, March 1974. 463 p. William E Sopper and Louis T Kardos (eds). EPA Project R-800678, Program Element 1BB045.

Descriptors: *Waste water disposal, Pollution abatement, *Waste water treatment, *Tertiary treatment, *Conferences, *Crop response, *Groundwater recharge, *Soil-water-plant relationships, *Municipal wastes, Cycling nutrients, Agronomic crops, Forests, Sprinkler irrigation, Environmental effects, Land use, Design data, Pathogenic bacteria, Costs, *Water reuse.
Identifiers: *Waste water reuse, *Waste water irrigation.

Intense interest in preserving the quality of the environment has reactivated interest in the management of wastewaters by applying them to the land. Use of land application approaches for wastewater management must be updated to conform to new concepts of conserving and protecting the quality of land and water resources. Design and operation of land-based wastewater management systems is dependent on site selection, the degree of water renovation desired, and the planned use of the site as well as the basic physical, chemical, and biochemical processes which influence system performance. The 32 individual papers included in this report are presented in sections which cover municipal wastewater characteristics, the function of the soil in the treatment process, vegetation responses, system design and cost, examples of operating systems, and the status of guidelines for land disposal of wastewater. (See W74-12870 thru W74-12901) (EPA)
W74-12869

CHEMICAL AND BIOLOGICAL QUALITY OF SEWAGE EFFLUENTS,
Rutgers-the State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
J. V. Hunter, and T. A. Kotalik.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 6-27. 14 tab, 70 ref.

Descriptors: *Waste water treatment, *Sewage, *Effluents, *Water quality, Microorganisms, Chlorination, Public health, Biological properties, Chemical properties.
Identifiers: *Effluent composition.

The chemical and biological composition of effluents reflects the quality of the waste water entering the plant and the changes that occur during the physical, chemical, and biological processes in the plant. The chemical changes that occur during treatment reflect the biological removal of 80-90 percent of the organic matter and the production of more oxidized organics. Interest in the removal of microorganisms during treatment lies mainly in the area involving the efficiency of pathogen removal. In addition to waste water bacteria, viruses that have persisted through the plant, large numbers of protozoa and nematodes can be developed during biological treatment. Interest here has centered on the nematodes which can ingest pathogens and thus have public health significance. Effluent chlorination is largely for disinfection; however, actual practice may not always achieve this end. Excessive chlorination without dechlorination may lead to toxicity problems in receiving waters. (See also W74-12869) (Sandoski-FIRL)
W74-12870

CHEMICAL AND BIOLOGICAL QUALITY OF MUNICIPAL SLUDGE,
Metropolitan Sanitary District of Greater Chicago, Ill.
J. R. Peterson, C. Lue-Hing, and D. R. Zenz.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 28-39. 3 tab, 16 ref.

Descriptors: *Sewage sludge, *Municipal wastes, *Waste water treatment, Chemical properties, Biological properties, *Sludge treatment, Treatment facilities, Methodology, *Water quality.

Sewage sludge is derived from the organic and inorganic matter removed from waste water at sewage treatment plants. The nature of sludges depends on the waste water sources and the method of waste water treatment. If waste solids are to be evaluated as a soil amendment or as a fertilizer, it is important to understand their chemical and biological properties. A comparison of sludge analyses from various treatment plants would be confounded by the individual treatment processes; therefore, some of the more common waste water treatment methods are described. (See also W74-12869) (Sandoski-FIRL)
W74-12871

THE SOIL AS A PHYSICAL FILTER,
Robert S. Kerr Water Research Center, Ada, Okla.
R. E. Thomas.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 40-46. 10 ref.

Descriptors: *Filters, *Soil amendments, *Soil analysis, Soil physical properties, *Waste water disposal, Soil disposal fields, Soil types, Suspended solids, Filtration, *Waste water treatment, Water reuse.

Soil is a mixture of mineral particles, organic material, air, and water. The pore space occupied by air or water may be as much as 50 percent of the total volume, and the pathway of movement through these pores is a maze of varying sized channels. It is the size distribution and the nature of this maze which controls the capability of the soil to filter out suspended solids that are found in treatment plant effluents or industrial waste waters. Several approaches to utilize this filtering capability of the soil for disposal or renovation of municipal effluents and industrial waste waters include septic tank-soil absorption systems, cropland irrigation systems, surface disposal systems, and groundwater recharge systems. Clogging of the filter and management practices which can be used to extend the life of the filter are discussed. (See also W74-12869) (Sandoski-FIRL)
W74-12872

THE SOIL AS A CHEMICAL FILTER,
Michigan State Univ., Lansing. Dept. of Crop and Soil Sciences.
B. G. Ellis.

Descriptors: *Filters, *Soil chemistry, *Ion exchange, *Adsorption, *Chemical precipitation, Soil chemical properties, Waste water disposal, Filtration, *Waste water treatment, Water reuse.

The areas of soil chemistry which are of most importance for the soil to act as a chemical filter are: ion exchange, adsorption and precipitation, and chemical alteration. This discussion includes the theory of each process and the importance of each process to waste disposal systems. (See also W74-12869) (Sandoski-FIRL)
W74-12873

THE SOIL AS A BIOLOGICAL FILTER,
Ohio State Univ., Columbus. Dept. of Agronomy.
R. H. Miller.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 73-94. 3 tab, 58 ref.

Descriptors: *Filters, *Soil bacteria, Municipal wastes, *Waste water disposal, Nitrification, Soil disposal fields, Application techniques, Aeration, *Waste water treatment, Filtration, Water reuse.

The groups of organisms comprising the soil biological filter are bacteria actinomycete, fungi, protozoa, algae, soil micro- and macro-animals, and higher plants. The various microbial reactions which influence the success of soil as a filter for renovating municipal waste water and sludge are reviewed. The majority of these activities are beneficial for maintaining the integrity and effectiveness of the soil filter. Only one reaction, nitrification, can be considered detrimental to the success of the soil filter when the disposal method maintains adequate soil aeration. Also, it should be emphasized that prolonged periods of anaerobiosis must be avoided for the proper functions of the microbial component of the soil filter. Finally, proper management of land disposal systems for liquid waste regardless of the mode of application must provide for periods of adequate aeration. (See also W74-12869) (Sandoski-FIRL)
W74-12874

SITE SELECTION CRITERIA FOR WASTEWATER DISPOSAL -- SOILS AND HYDROGEOLOGIC CONSIDERATIONS,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
R. R. Parizek.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 95-130. 5 tab, 48 ref.

Descriptors: *Sites, *Irrigation systems, Soil, Geology, Hydrology, Topography, Project planning, *Waste water treatment, Recycling, Environmental control, *Waste water disposal, *Water reuse.
Identifiers: *Spray irrigation.

Site selection criteria for sewage effluent spray irrigation sites are discussed. Soils, geology, hydrology, topography, project management, and other factors are considered to maximize the chances for achieving a high degree of renovation of waste constituents while at the same time minimizing secondary environmental problems that can result. Site conditions suitable and unsuitable for groundwater recharge and reuse are pointed out as are factors to be considered when designing monitoring programs necessary to prove the degree of treatment being achieved. Finally, the importance of the hydrogeologic-soil condition is discussed for the benefit of administrators who are responsible for defining environmental procedures to be used for waste water irrigation projects. (See also W74-12869) (Sandoski-FIRL)
W74-12875

RENOVATION OF MUNICIPAL WASTEWATER THROUGH LAND DISPOSAL BY SPRAY IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
L. T. Kardos, and W. E. Sopper.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 131-145. 8 tab, 3 ref.

Descriptors: *Soil disposal fields, *Irrigation systems, Data collections, Evaluation, Waste water disposal, *Waste water treatment, Groundwater recharge, Potable water, *Water reuse.
Identifiers: *Spray irrigation.

In a Penn State project soil solution samples were extracted with suction lysimeters installed at various depths in the soil profile. The chemical quality of the chlorinated secondary treated waste water was monitored by obtaining a composite of the waste water being applied through the sprinklers during each irrigation sequence. Average annual concentrations of various constituents in the applied waste water are shown for the corn rotation area for 1963-1970 and are representative of the concentrations in waste water applied to the other areas. The extent of renovation of the applied waste water may be expressed as the change in mean annual concentration of a particular constituent in the applied waste water when compared with that found in the soil solution in the suction lysimeters. The data allow one to conclude that with appropriate management of nitrogen loads to maximize utilization by the vegetation and with hydraulic loads adjusted to the soil site to maximize denitrification it should be possible to recharge water of drinking water quality into the aquifer below a waste water disposal site. (See also W74-12869) (Sandoski-FIRL)
W74-12876

RENOVATING SECONDARY EFFLUENT BY GROUNDWATER RECHARGE WITH INFILTRATION BASINS,
Agriculture Research Service, Phoenix, Ariz. Water Conservation Lab.
H. Bouwer.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 146-156. 1 tab, 10 ref.

Descriptors: *Groundwater recharge, *Pit recharge, Data collections, *Design criteria, *Arizona, Performance, Infiltration, *Waste water treatment, Tertiary treatment, *Water reuse.
Identifiers: *Salt River Valley(Ariz), *Infiltration basins.

The Salt River Valley in Central Arizona is changing from a predominantly agricultural to a predominantly urban valley. Groundwater currently supplies about one-third of the municipal and agricultural water needs in the area of the Salt River Project. The resulting depletion of the groundwater can be reduced if the sewage effluent produced by the increasing population can be reused. Unrestricted use of sewage effluent for recreational lakes and irrigation requires tertiary treatment. A promising technique for such treatment in the Salt River Valley would be by groundwater recharge with spreading basins in the Salt River bed. Because the performance of a land-filtration system depends so much on the local conditions of climate, soil, and groundwater, a pilot system, called the Flushing Meadows Project, was installed in 1967. The findings obtained and their use in the design of a large-scale system are presented. (See also W74-12869) (Sandoski-FIRL)
W74-12877

PHOSPHORUS AND NITRATE LEVELS IN GROUNDWATER AS RELATED TO IRRIGATION OF JACK PINE WITH SEWAGE EFFLUENT,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
D. H. Urie.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 157-164. 2 tab, 5 ref.

Descriptors: *Nutrients, *Groundwater, *Phosphorus, *Nitrates, Testing, *Sewage effluents, On-site tests, Irrigation, Public health, Water table, Soil types, Waste water treatment, Lysimeters, *Jack pine trees.

The North Central Forest Experiment Station has begun research on the effects of sewage effluent on groundwater nutrient levels. Results from an initial test conducted near Cadillac, Michigan are discussed. This exploratory test was conducted to gain background information on the methods useful in conducting field tests of sewage effluent renovation where only small volumes of effluent are available. The single plot test illustrates that the nitrates added in sewage effluent irrigation may reach shallow water tables under sand-soil forest conditions. Phosphorus renovation was complete during the initial year. Public health considerations may limit the permissible dosage levels in such highly permeable soils. Experience with this single plot test has resulted in the adoption of a different type of field test in locations where sewage effluent must be trucked to the test site. Tests now in progress utilize plots about 0.001 hectare in area using gravity methods of application. Tension lysimeters are being used instead of wells to test the degree of renovation under various treatments. (See also W74-12869) (Sandoski-FIRL)
W74-12878

RESTORATION OF ACID SPOIL BANKS WITH TREATED SEWAGE SLUDGE,
Forest Service (USDA), Harrisburg, Ill. Shawnee National Forest.
T. R. Lejcher, and S. H. Kunkle.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 165-178. 4 tab, 15 ref.

Descriptors: *Sludge treatment, *Spoil banks, Municipal wastes, Investigations, Hydrogen ion concentration, Vegetation establishment, Acidity, Chemcontrol, Runoff, *Illinois, Strip mines, *Sewage sludge, *Waste water treatment, Water reuse.

Preliminary results of a strip mined reclamation demonstration project in Southern Illinois are detailed. The initial observations indicate that treated municipal sludge, when applied to the spoil in sufficient amounts, improves spoil pH, allows establishment of vegetation, and reduces acidity and concentrations of some of the chemicals in the runoff issuing from the tract. (See also W74-12869) (Sandoski-FIRL)
W74-12879

EFFECTS OF LAND DISPOSAL OF WASTEWATERS ON SOIL PHOSPHORUS RELATIONS,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
J. E. Hook, L. T. Kardos, and W. E. Sopper.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 179-195. 5 tab, 11 ref.

Descriptors: *Phosphorus, *Soil disposal fields, Landfills, Monitoring, Sewage effluents, Municipal wastes, Forests, Farm management, Agronomy, Nutrients, *Waste water disposal, *Waste water treatment, *Water reuse, *Path of pollutants.
Identifiers: *Land disposal.

The movement and fixation of phosphorus, a major constituent of many waste waters, are important considerations in land disposal systems. In the Wastewater Renovation and Conservation Research Project at The Pennsylvania State University, the fate of phosphorus has been monitored as treated municipal sewage effluent was applied to cropland and forested areas. Ten years of monitoring has indicated a high degree of efficiency of the soil-plant system to retain and use phosphorus. The chemical forms in which the phosphorus was being retained and to what depth in the soil it was accumulating are described. It is concluded that when the system is properly managed most of the added phosphorus remains in the soil at the disposal site or leaves as a nutrient in harvested crops. (See also W74-12869) (Sandoski-FIRL)
W74-12880

EFFECTS OF LAND DISPOSAL OF WASTEWATER ON EXCHANGEABLE CATIONS AND OTHER CHEMICAL ELEMENTS IN THE SOIL,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
L. T. Kardos, and W. E. Sopper.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 196-203. 1 fig, 1 tab, 7 ref.

Descriptors: *Reviews, Sampling, *Sodium, *Cations, *Waste water treatment, Forests, Rotations, Boron, Chlorides, Nitrogen, Organic matter, Water reuse, *Path of pollutants, *Soil chemistry.
Identifiers: *Exchangeable sodium percentage.

In a literature review by Ivor K. Edwards (1968) it was indicated that most of the concern with respect to soil chemical changes was with respect to changes in the amounts of sodium relative to the other exchangeable cations in the soil. In soil samples taken in 1966 Edwards found no significant change in the status of the exchangeable cations from that found in 1963 after 48 inches of waste water had been applied. By 1966 the exchangeable sodium percentage (ESP) in the waste water treated areas had increased with respect to the control area about 4-fold in the upper foot and 1.5 to 2-fold in the next four feet. However, the maximum ESP value in 1966 was only 3.3 and occurred in the upper foot of the 2-inch per week treatment area. The present report extends the information through the soil sampling in 1969 and also reports on changes in the status of exchangeable Mn, adsorbed chloride and boron, kjeldahl nitrogen, and organic matter in the crop rotation area and in some of the forested areas. (See also W74-12869) (Sandoski-FIRL)
W74-12881

FACTORS AFFECTING NITRIFICATION-DENITRIFICATION IN SOILS,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
F. E. Broadbent.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 204-214. 5 tab, 18 ref.

Descriptors: *Nitrification, *Denitrification, Soils, *Soil chemical properties, Bacteria, *Nitrogen fixing bacteria, Path of pollutants.

Nitrifying bacteria are present in almost all soils and are active over a wide range of moisture and temperature conditions. Variations are examined where nitrification and denitrification can and do occur simultaneously in the same soil lake, pond, or stream, often in locations physically separated by only very short distances. (See also W74-12869) (Sandoski-FIRL)
W74-12882

BIOTOXIC ELEMENTS IN SOILS,
Illinois Univ., Urbana. Dept. of Agronomy.
T. D. Hinesly, and R. L. Jones.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 215-216.

Descriptors: *Sewage effluents, *Municipal wastes, *Waste water treatment, Tertiary treatment, Chemical properties, Water pollution control, Environmental control, Toxicity, *Path of pollutants, Irrigation, Land management, Trace elements, *Elements(Chemical).
Identifiers: Biotoxic elements.

Application of stabilized municipal waste treatment plant residues on agricultural lands is the most economically viable solution to a growing solids disposal problem. Yet, it is a small problem from the standpoint of its utilization by agriculture. Only enough sludge solids would be available to treat slightly more than 0.2 percent of the 465 million acres of cropland or slightly less than 0.06 percent of the total 1904 million acres contained in the United States. It is recognized that the solids from many small waste water treatment plants will probably continue to be recycled to cropland. Thus it is necessary to attempt to identify those chemical elements which tend to be ubiquitously present in relatively high concentration in municipal waste waters and sludges and might accumulate in soils in forms available to crop plants at concentrations which may be injurious to plants or to animals consuming the produce. (See also W74-12869) (Sandoski-FIRL)
W74-12883

MICROBIAL HAZARDS IN DISPOSING OF WASTEWATER ON SOIL,
Illinois Univ., Urbana. Dept. of Civil Engineering.
D. H. Foster, and R. S. Engelbrecht.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 217-241. 4 tab, 74 ref.

Descriptors: *Reviews, *Public health, *Waste water disposal, Irrigation systems, *Waste water treatment, Investigations, *Water reuse, Pathodogy, Microbiology, Epidemics.

The public health dangers that may arise from the ultimate disposal of wastes on land are explored; public apprehension concerning health hazards are assessed. This work was undertaken to provide officials with the type of information that will allow a rational, unemotional, and realistic assessment of the potential public health problems associated

with the application of waste water to land. It is shown that the literature is quite unusual in the paucity of information available on irrigation-caused epidemics, reflecting either an absence of a problem despite other evidence indicating that significant quantities of pathogens are placed on soil by this practice, or that prejudices which regard only significant outbreaks of disease are worthy of investigation. (See also W74-12869) (Sandoski-FIRL)
W74-12884

VEGETATION RESPONSES TO IRRIGATION WITH TREATED MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sopper, and L. T. Kardos.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 242-269. 19 tab, 7 ref.

Descriptors: *Irrigation systems, *Sewage effluents, *Waste water treatment, *Water reuse, Investigations, Application techniques, Forests, Farm management, Crops.
Identifiers: Spray irrigation.

The Penn State waste water renovation and conservation project is reviewed. Under this plan, treated municipal sewage effluent has been spray irrigated on cropland and in forest stands for a 10-year period. Effluent has been applied in various amounts ranging from one inch per week to six inches per week and over various lengths of time ranging from 16 weeks during the growing season on cropland to the entire 52 weeks in forests. Rates of application varied from 0.25 to 0.64 inch per week. Types of crops irrigated with effluent were wheat, oats, corn, alfalfa, red clover, and reed canary grass. Forested areas irrigated consisted of a mixed hardwood forest, a red pine plantation, and a sparse white spruce plantation established on an abandoned old field. It is shown that sewage effluent irrigation during the past ten years has produced beneficial vegetation responses. Crop yields and tree growth were significantly increased. In addition the value of the vegetation as a renovating agent has been demonstrated to be a vital part of the system. For year-round operations a combination of cropland and forestland provide the greatest flexibility in operating a system using the living filter concept. (See also W74-12869) (Sandoski-FIRL)
W74-12885

ANATOMICAL AND PHYSICAL PROPERTIES OF RED OAK AND RED PINE IRRIGATED WITH MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. K. Murphey, R. L. Brisbin, W. J. Young, and B. E. Cutter.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 270-285. 6 tab, 24 ref.

Descriptors: *Forests, *Sewage effluents, *Waste water disposal, Groundwater recharge, Pulp and paper industry, Waste water treatment, *Water reuse, *Municipal wastes.
Identifiers: *Spray irrigation, Pulp fibers.

The technique of using the forest to ameliorate treated sewage plant effluent while charging the groundwater can alter the properties of the wood being produced. Primarily this study was concerned with the utility of wood grown in such a forest for pulp wood. The morphology of the pulp fiber is important in the strength and conformity of the paper sheet and, therefore, the utility of the pulp. Alteration of the dimensions of the pulp fibers by the waste water were such as to enhance their use as a raw material for paper. The lack of a separate control area restricted the findings. The results of these experiments indicate that a 1-inch spray enhanced the fiber properties of red pine. A 2-inch application of the effluent was beneficial if red oak is used as a pulp species. (See also W74-12869) (Sandoski-FIRL)
W74-12886

DEER AND RABBIT RESPONSE TO THE SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT ON WILD LAND,
Pennsylvania State Univ., University Park. School of Forest Resources.
G. W. Wood, D. W. Simpson, and R. L. Dressler.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 286-298. 6 tab.

Descriptors: Evaluation, *Sewage effluents, Irrigation systems, *Deer, Wildlife, Forages, Small game, Water pollution effects, *Water reuse, *Chlorination, Waste water treatment.
Identifiers: *Rabbits, *Spray irrigation, Forage nutrition.

The first efforts in evaluating the effects of sewage effluent irrigation treatment areas on wild animals have been directed toward the principal game species, the cottontail rabbit and the white-tailed deer. Experimental results indicate that the spray irrigation of chlorinated sewage effluent at the rate of two inches per week appears to have a favorable influence on the nutritive value of rabbit and deer forages. Generally the crude protein, P, K, and Mg can be expected to be raised in these forages while the Ca is lowered. Reed canarygrass, the only forage tested for changes in digestibility due to treatment, showed no significant response with respect to digestible dry matter and protein. Studies using the lead deer technique to determine preference for or avoidance of irrigated sites and forage from these sites indicate that the deer use treated sites at least as readily as untreated sites. During the winter period wild deer do not avoid the area but appear to use it quite readily for resting and feeding. (See also W74-12869) (Sandoski-FIRL)
W74-12887

SPRINKLER IRRIGATION SYSTEMS: DESIGN AND OPERATION CRITERIA,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
E. A. Myers.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 299-308. 1 fig, 2 ref.

Descriptors: *Waste water treatment, *Water reuse, Application techniques, *Design criteria, Administration, *Irrigation systems, *Operations, Land management.

Waste water must be applied uniformly over the land surface at the proper rate in inches per hour and the appropriate amount in inches per week if adequate renovation is to be expected. Two areas which greatly affect this judicious application are proper design and diligent management. This paper first lists the variables involved in the design of an irrigation distribution system, then discusses a number of factors which affect the choice of specific value for each variable. Comments concerning the various management decisions that must be made when operating the system are included. (See also W74-12869) (Sandoski-FIRL)
W74-12888

COST OF SPRAY IRRIGATION FOR WASTE WATER RENOVATION,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
J. B. Nesbitt.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 309-314. 2 fig, 1 tab, 1 ref.

Descriptors: *Estimated costs, *Irrigation systems, *Design criteria, Land management, Operations, *Waste water disposal, *Waste water treatment, Water reuse.
Identifiers: *Spray irrigation, Pumping system, Delivery system.

The net cost of effluent disposal by spray irrigation is dependent upon the system required to do a specific job, at a specific location, at a specific time, as well as the procedures adopted for management of the spray field. Since different situations require different designs and management procedures, no general overall cost information can be given; however, if certain basic assumptions are made about design and management, a rough cost estimate can be made. The figures presented are based on work done by Allender with estimated cost of hypothetical systems carrying flows of one, five, and ten million gallons per day being presented. The figures are based on certain assumptions regarding design and management. These assumptions may or may not fit another specific situation but they will define the basis of the estimates discussed under the general areas of pumping system, delivery system, and operation. (See also W74-12869) (Sandoski-FIRL)
W74-12889

FINANCING MUNICIPAL WASTE WATER TREATMENT FACILITIES, INCLUDING LAND UTILIZATION SYSTEMS,
Environmental Protection Agency, Washington, D.C. Div. of Municipal Waste Water Programs.
B. L. Seabrook.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 315-321.

Descriptors: *Pollution abatement, *Regulations, Investigations, Industrial wastes, *Waste water treatment, Water reuse, *Costs, Legislation, *Treatment facilities, *Financing.

A continuing need for pollution abatement facilities will always exist after standards have been achieved to compensate for a growing population, obsolescence, and industrial expansion. Accomplishing this goal will require the cooperation of industry and dedication at all levels of government. Herein detailed are General Accounting Office (GAO) studies, recent Federal regulations, industrial waste cost recovery guidelines, and clean water bills. (See all W74-12869) (Sandoski-FIRL)
W74-12890

LARGE WASTEWATER IRRIGATION SYSTEMS: MUSKEGON COUNTY, MICHIGAN AND CHICAGO METROPOLITAN REGION,
Bauer Engineering, Inc., Chicago, Ill.
W. J. Bauer, and D. E. Matsche.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 322-341. 1 tab.

Descriptors: *Capital costs, *Operating costs, *Irrigation systems, Project planning, *Waste water treatment, Land management, Water reuse, *Michigan, *Illinois.
Identifiers: Chicago(Ill), Muskegon County(Mich).

The capital and operating costs for the Muskegon County, Michigan project and for the Chicago Regional Wastewater plan are presented in a form useful for making comparisons with alternative systems. Auxiliary uses of land irrigation sites are described briefly and the approximate potential revenues from each estimated. The operating costs of the system would be largely, if not entirely, off-

set by using the same land irrigation site for many other purposes in addition to that of renovating the wastewater. No discussion of the benefits of treating the waste water to drinking water standards is presented as these benefits would be comparable for any other system which would achieve the same end result. (See also W74-12869) (Sandoski-FIRL)
W74-12891

IMPLEMENTING THE CHICAGO PRAIRIE PLAN,
Metropolitan Sanitary District of Greater Chicago, Ill.
F. Kudrna, and G. Kelly.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 342-347.

Descriptors: *Project planning, *Recycling, *Sewage disposal, *Watershed management, Filters, Application techniques, Monitoring, Water quality control, *Water reuse, *Illinois, *Waste water treatment.
Identifiers: *Chicago Prairie plan.

The Metropolitan Sanitary District of Greater Chicago has developed a program for the recycle and reuse of sewerage solids, the by-products of the water reclamation process. It is a far-reaching, environmentally sound program called the 'The Prairie Plan'. Based on a principle of watershed planning, it utilizes the ground as an immense, natural filter and collection system. Utilizing a single watershed with known physical characteristics as the basis for application, not only do the soil and living parts act as a filter, but also there is a natural way to collect all of the filtered runoff at one point for continuous monitoring and water quality control. The result is a flowing stream which is clean, free from silt, and potentially a valuable resource for recreational, commercial, and industrial development. The first implementation of 'The Prairie Plan' is being carried out on over 7000 acres of land in Fulton County, Illinois. A descriptor of the plan is given. (See also W74-12869) (Sandoski-FIRL)
W74-12892

MT. SUNAPEE STATE PARK, NEW HAMPSHIRE SPRAY IRRIGATION PROJECT,
New Hampshire Water Supply and Pollution Control Commission, Concord.
T. P. Frost, R. E. Towne, and H. J. Turner.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 348-361. 8 tab, 3 ref.

Descriptors: *Sewage effluents, *Irrigation systems, Forests, *New Hampshire, Design criteria, Project planning, Data collections, Groundwater, Water quality, Surface waters, *State Parks, *Water reuse.
Identifiers: *Spray irrigation, *Mt Sunapee St. Park(NH).

The Sunapee State Park spray irrigation system in Newbury, New Hampshire, distributes pretreated sewage to mountain slopes forested with mixed hardwoods and scattered conifers interspersed with an occasional apple tree indicating orchard or pastureland abandoned a generation ago. Conifers tend to dominate the lower part of the slope with the numbers of oaks and birches increased toward the upper levels. The system was planned and designed around the Pennsylvania State University project. Preliminary analyses of the data indicate that spray irrigating with pretreated sewage stabilization pond effluent has not resulted in any substantial or discernible alteration in the composition of the groundwater in the test wells, water from the drinking wells, or downstream surface waters. In conclusion, this small, seasonal, atypical sewage spray irrigation system appears to have worked effectively to date to protect contiguous groundwater and surface waters. Based on experience in New Hampshire and Pennsylvania, it is the opinion of the New Hampshire Water Supply and Pollution Control Commission staff that the Sunapee system will probably continue to operate effectively for a long and perhaps indefinite period of time at the present mode of operation. (See also W74-12869) (Sandoski-FIRL)
W74-12893

UTILIZATION OF SPRAY IRRIGATION FOR WASTEWATER DISPOSAL IN SMALL RESIDENTIAL DEVELOPMENTS,
Williams and Works, Inc., Grand Rapids, Mich.
T. C. Williams.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 362-374. 3 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Michigan, *Irrigation systems, Ponds, Performance, *Design criteria, *Waste water disposal, *Michigan.
Identifiers: *Spray irrigation.

This corporation has designed sixteen pond and irrigation waste water treatment systems for various governmental units in Michigan. Designs for the systems developed include: two facultative ponds designed to operate either in parallel or in series at the discretion of the operator; a series of ponds, consisting of an anaerobic cell followed by at least three facultative cells; and, mechanically aerated ponds followed by holding ponds. Performance and application of these systems are discussed. (See also W74-12869) (Sandoski-FIRL)
W74-12894

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION WITH RECLAIMED WATER,
California Univ., Riverside. Dept. of Plant Sciences.
V. B. Youngner, W. D. Kesner, A. R. Berg, and L. R. Green.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 375-386. 5 tab, 9 ref.

Descriptors: *Feasibility studies, *Waste water treatment, Groundwater recharge, *Water reuse, *Irrigation systems, Recreation demand, Ecology, *Reclaimed water.
Identifiers: *Greenbelt irrigation.

The feasibility of using waste water from the mountain communities to irrigate greenbelts strategically placed would reduce the wildfire hazard while disposing of waste water, recharging groundwater reservoirs with purified water, and creating new manageable recreation areas. Although no conclusive results have been obtained during the short time this study has been underway, observations to date are sufficiently encouraging to make continued study highly worthwhile. Clearly irrigation of chaparral during the dry season will increase the moisture content of the wood and leaves. Conversion of chaparral brush lands to grasses and other plants presenting a lower fire hazard appears possible through waste water irrigation. The most satisfactory species with particular reference to the use of the irrigated areas for recreation must still be determined. (See also W74-12869) (Sandoski-FIRL)
W74-12895

MUNICIPAL WASTEWATER DISPOSAL ON THE LAND AS AN ALTERNATE OF OCEAN OUTFALL,
Bauer Engineering, Inc., Chicago, Ill.
W. A. Cowlishaw, and F. J. Roland.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 387-399. 1 tab.

Descriptors: *Land management, *Waste water disposal, *Waste water treatment, Irrigation systems, *Massachusetts, Groundwater recharge, Water pollution control, Project feasibility, *Alternate planning, Municipal wastes, Water reuse.
Identifiers: *Falmouth(Mass), *Spray irrigation.

Land treatment as an alternative to ocean disposal of partially treated industrial and municipal wastes is examined. The specific decision choice for Falmouth, Massachusetts, is used to highlight the political, engineering, and resource management factor of decisions that juxtapose land treatment and ocean disposal. Analysis indicates that the land disposal-spray irrigation alternatives for managing waste water would better serve the needs of the Falmouth region for its effects in treating waste water; the spray irrigation system is superior. Its pollutant removal efficiency clearly exceeds the ocean outfall system in its effective removal of pollutants. In addition to the efficiency and reliability of this system for purifying waste water, it provides numerous related benefits applicable to the regional water resources. These include: a large percentage return of the treated waste water to the groundwater resources; flexibility for retrieving and transferring treated water; provision of usable crops from the irrigation of marginal land for agricultural purposes; no adverse affect on any marine life or on the recreational value of the waters; and, an integration of the spray irrigation site with numerous other publicly funded projects. (See also W74-12869) (Sandoski-FIRL)
W74-12896

THE ROLE OF LAND TREATMENT OF WASTEWATER IN THE CORPS OF ENGINEERS WASTEWATER MANAGEMENT PROGRAM,
Corps of Engineers, Washington, D.C. Waste water Management Task Force.
J. F. Johnson.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 400-409. 14 ref.

Descriptors: *Project planning, *Land management, *Waste water treatment, Waste water disposal, Project feasibility, Project purposes, Federal government, *Governmental interrelations.

The continuing problems of environmental degradation, particularly that caused by the discharge of a broad spectrum of pollutants into water courses, have prompted the Corps of Engineers to assist state, regional, and local governments in developing waste water management plans toward their solution. As a part of its urban studies program, the Corps will develop an array of plans in consonance with local planning agencies from which the people of the region could choose the specific plan which best meets their needs. The role of land treatment is discussed with particular emphasis upon its relationship to the planning process, the impacts associated with land disposal, and certain research needs related to land disposal of waste water. (See also W74-12869) (Sandoski-FIRL)
W74-12897

MICHIGAN'S EXPERIENCE WITH UTILIZING THE TEN STATES GUIDELINE FOR LAND DISPOSAL OF WASTEWATER,
Michigan Dept. of Public Health, Lansing. Div. of Wastewater.
D. M. Pierce.

In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 410-413. 1 ref.

Descriptors: *Design criteria, *Soil disposal fields, Performance, *Waste water treatment, *Land management, *Waste water disposal, *Michigan, Water reuse.

Nearly fifty communities have designed land disposal systems, yet only two of these have been in operation longer than one year. Even in this early stage of operational experience, some critical deficiencies in design are evidenced. Case illustrations indicate unsatisfactory performance attributable to tight soils with loading capabilities less than assumed in the design of the system, coupled with high groundwater, inadequate drainage, and in one case topography conducive to sheet runoff. Also the State's lack of experience has led to periods of uncertainty and apprenhension with regards to land disposal design and operation. (See also W74-12869) (Sandoski-FIRL)
W74-12898

FOREST SERVICE POLICY RELATED TO THE USE OF NATIONAL FOREST LANDS FOR DISPOSAL OF WASTEWATER AND SLUDGE,
Forest Service (USDA), Washington, D.C. Div. of Watershed Management.
O. C. Olson, and E. A. Johnson.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 414-419.

Descriptors: *Waste water disposal, *Federal Government, *Forests, Soil disposal fields, *Waste water treatment, Sludge treatment, Irrigation systems, *Federal project policy.

With some notable exceptions in the area of land reclamation and rehabilitation, it is generally true that the primary concern of the Forest Service is more one of aiding disposal with minimum deterimental impacts than it is one of looking to onsite benefits. This is in support of the established policy that Forest Service programs contribute to community development and to the improvement of the rural environment in general. At the present time there are 26 sites on National Forests in 14 States involved in planning for land disposal of waste water and/or sludges by sprinkler or flood irrigation. Federal department requirements and general objectives are discussed in relation to the Forest Service policy. (See also W74-12869) (Sandoski-FIRL)
W74-12899

SPRAY IRRIGATION--THE REGULARTORY AGENCY VIEW,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Ground Water Quality Management Unit.
R. C. Rhindress.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 420-434.

Descriptors: *Irrigation systems, *Regulation, Environmental control, Waste disposal, Soil disposal fields, *Pennsylvania, Legal aspects, *State governments.
Identifiers: *Spray irrigation.

The Bureau of Water Quality Management of the Pennsylvania Department of Environmental Resources is the regulatory agency concerned with the protection from pollution of all the waters within the state. A regulatory agency becomes aware of spray irrigation from two separate sources: as a new technique being promoted and as enforcement officials viewing a number of existing problems. An environmental protection agency has an obligation to consider all techniques of waste disposal and to assess their applicability to various wastes and their impact upon the environment. The experiences of the department with spray irrigation are discussed together with the philosopy concerning the use of land disposal techniques, and some important concepts which are included in their Spray Irrigation Manual. (See also W74-12869) (Sandoski-FIRL)
W74-12900

RESEARCH NEEDS--LAND DISPOSAL OF MUNICIPAL SEWAGE WASTES,
Forest Service (USDA), Washington, D.C.
J. O. Evans.
In: Conference on Recycling Treated Municipal Wastewater Through Forest and Cropland, August 21-24, 1972, The Pennsylvania State University, University Park, p 435-442, 1 fig, 6 ref.

Descriptors: *Reviews, *Conferences, Research and development, Municipal wastes, Sewage disposal, Recycling, Soil disposal fields, *Research priorities, *Waste water disposal, *Water reuse, *Waste water treatment.

A review of topics discussed throughout the conference is presented. Immediate research needs with regards to municipal sewage waste disposal include: the mechanics for efficient and effective handling of sewage wastes and disposal on various land areas; economic factors relative to various or alternative handling and disposal methods; waste-management problems having their roots in the social, economic, legal, and political areas; the interactions between various soil types and applied wastes; transport methods and costs, from sewage source to disposal site; soil microorganisms to degrade, stabilize, and render sewage wastes innocuous; pathogen transfer to susceptible hosts as a function of time since spreading and previous treatment of the sludge; alternative treatments in effluent disposal to eliminate health hazards from nitrates and other toxic substances; long-term effects of various sludges on appropriate land areas; the tolerance of crops and forests to various heavy metals deposited with organic sewage sludges; effluent and sludge recycling in areas that remain frozen over extended periods of time; standards and guidelines for the use of sewage effluent as irrigation-fertilization and aquifer recharge water, and of sewage sludge as a fertilizer and soil conditioner; toxic conditions in plants resulting from excessive phosphate accumulations in soils; and how odor problems can be prevented, eliminated, or effectively controled. (See also W74-12869) (Sandoski-FIRL)
W74-12901

ECOLOGY AND ANALYSIS OF TRACE CONTAMINANTS, PROGRESS REPORT JUNE 1972-JANUARY 1973.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-12905

ZONAL CENTRIFUGATION: APPLIED ASPECTS IN ELUCIDATING CHEMICAL AND BIOLOGICAL FORMS, DISTRIBUTION AND AVAILABILITY OF HEAVY METALS IN THE ENVIRONMENT,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-12910

REMOVAL OF MERCURY AND OTHER TOXIC METALS FROM PLANT EFFLUENT SOLUTIONS BY SOLVENT EXTRACTION,
Oak Ridge National Lab., Tenn.
F. L. Moore.
In: Report No. ORNL-NSF-EATC-1, p 349-365, March 1973. 2 fig, 5 tab, 7 ref.

Descriptors: Water pollution, Pollution abatement, *Metals, *Toxins, *Mercury, *Cadmium, Effluents, *Industrial wastes, *Solvent extractions, Research and development, Ammonium, Chlorides, *Waste water treatment.

Research and development studies have led to new, practicable industrial separation methods for pollution abatement of toxic metals. Current major emphasis is on the removal of mercury and cadmium from industrial effluent solutions. Solvent extraction with high-molecular-weight amines is a highly efficient method for the removal of these toxic metals from aqueous halide solutions. The quaternary amines, Aliquat 336 or Adogen 464 (methyltri(C8-C10)ammonium chlorides) are especially attractive because of their ability to extract mercury or cadmium at both subnanogram and macro levels from alkaline as well as acidic chloride, bromide or iodide solutions. These studies have developed a simple process for the abatement of mercury pollution in industrial brines and hydrochloric acid solutions. Studies in the amineiodide system led to a new method for the isolation and concentration of cadmium and mercury. Moreover, the technique achieves the quantitative separation of cadmium from mercury. (See also W74-12905) (Houser-ORNL)
W74-12917

ELECTROCHEMICAL REMOVAL OF REDUCIBLE INORGANIC POLLUTANTS FROM AQUEOUS STREAMS,
Oak Ridge National Lab., Tenn.
F. A. Posey, and A. A. Palko.
In: Report No. ORNL-NSF-EATC-1, p 367-389, March 1973. 11 fig, 6 ref.

Descriptors: *Water pollution treatment, Streams, *Mercury, *Electrochemistry, *Electrodes, Ions, Carbon, Brines, Pollution abatement, *Waste water treatment.

Results of studies on removal of dissolved mercury from flowing streams by porous carbon electrodes are presented. The effects of complexing agents, temperature, pH, and other factors on the rate of reduction of mercuric ion on a carbon substrate are discussed. Construction details of an experimental assembly for measurement of removal efficiencies of porous carbon electrodes are presented, along with experimental results on mercury removal from simulated chlor-alkali plant brine. The mode of deposition of mercury on carbon electrodes is discussed and implications for development of practical mercury-removal devices are noted. (See also W74-12905) (Houser-ORNL)
W74-12918

WASTE WATER TREATMENT AND SLUDGE DISPOSAL AT THE CESKA KAMENICE PAPER MILL (CISTENI ODPADNICH VOD A LIKVIDACE SEDIMENTU V ZAVODE 25. UNORA V CESKA KAMENICI),
Ceska Kamenice Paper Mill (Czechoslovakia).
J. Lukac.
Papir a Celuloza, Vol 29, No 3, p 61-62, 1974. 3 fig, 2 tab.

Descriptors: *Centrifugation, Treatment facilities, Europe, *Waste water treatment, *Sludge treatment, *Sludge disposal, Waste treatment, *Pulp wastes, Pulp and paper industry, Equipment, Effluents, Dewatering, Lime, Fibers(Plant), Recycling.
Identifiers: *Czechoslovakia, Board mills, Paper mills, Sulfite pulp mills.

An effluent-treatment facility installed in 1964 at a Czechoslovakian pulp and paper mill comprised a mixing chamber for lime dosage and two clarifiers. Clarifier sludge was reused in paper and paperboard furnishes. Shutdown of the sulfite pulp mill and other water management measures between 1966-1970 substantially reduced the effluent

volume, but also changed the quality of sedimented sludge. In lieu of long fibers, the sludge contained a mixture of fines (fine fibers) and inorganic fillers which could no longer be recycled and required temporary pond storage. For treatment of this sludge, a VS-500 Alpha-Laval centrifuge having a throughput of 18 cu m/hr and a capacity of 620 kg dry solids/hr was installed to dewater gravity-thickened clarifier sludge from 4% to 23.8% of dry solids. (Trubacek-IPC)
W74-12921

THE COLOR OF WASTE LIQUOR FROM PULP INDUSTRY. IV. THE INTERACTION OF CL(2)-OXYLIGNIN WITH METAL SALTS (2), (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture.
K. Sameshima, M. Sumimoto, and T. Kondo.
Journal of the Japan Wood Research Society (Mokuzai Gakkaishi), Vol 20, No 1, p 21-25, Jan 1974. 8 fig, 13 ref. (English summary).

Descriptors: *Pulp wastes, *Bleaching wastes, *Color, *Lignins, *Chlorine, Waste treatment, *Flocculation, *Waste water treatment, Aluminum, *Coagulation, Chemical precipitation, Hydrogen ion concentration, *Chelation, Nitrates, Physicochemical properties, Chlorination, Pulp and paper industry, Foreign research.
Identifiers: Chelates, Complex compounds, Aluminum nitrate, Aluminum compounds, Chlorine compounds, Japan, Quinones, Protocatechuic acid, Benzoquinone, Kraft pulps.

Chlorinated oxidized lignin is the main coloring substance in spent liquors from multistage bleaching of kraft pulp. Its reaction with metal salts, notably aluminum nitrate, was studied as an effective decoloring treatment. The dosage needed for 90% color removal increased with increasing pH of the liquor. Although the optimum pH could not be ascertained accurately, it is about pH 5, judging from the physical properties of precipitated flocs. The major coagulation mechanism involves chelate formation below pH 8, the chelating sites of chloro-oxylignin being probably hydroxybenzoquinone and protocatechuic acid structures in the lignin macromolecule. Chelation below pH 5 differs from chelate formation at higher pH. (See also W74-04512) (Brown-IPC)
W74-12924

RECYCLING HELPS PAPER MILLS CLEAN UP THEIR IMAGE.
Chemical Week, Vol 114, No 18, p 33-34, May 1, 1974. 2 fig.

Descriptors: Waste treatment, *Pulp wastes, *Waste water treatment, *Water conservation, *Sulfite liquors, *Treatment facilities, Pulp and paper industry, *Recycling, Solid wastes, Effluents, Capital costs, Operating costs, Costs, Economics, Biochemical oxygen demand, Water consumption(Except consumptive use), Sodium compounds, South Carolina, Washington, Pulp and paper industry.
Identifiers: Sulfite pulp mills, Paperboard mills, Spent sulfite liquors, Chemical recovery.

Two new processes developed by Sonoco Products Co. (Hartsville, S.C.) and Fibreboard Corp. (Summer, Wash.) have cut the costs of waste water treatment while recovering and conserving valuable raw materials. The Sonoco process recovers sodium sulfate, carbonate, and hydroxide from spent Na-base sulfite pulping liquor in an installation costing ca. $2-2.5 million, but at a recovered chemical cost of $5 per ton, compared to $12 per ton for most other treatment systems. The smaller Fibreboard facility recovers ca. 1600 lb/day of solid wastes from effluents previously discharged into the Stuck River and recycles them into paperboard furnish, while reducing the BOD of discharged wastes by ca. 95% and the consumption of freshwater from 940,000 to 450,000 gal/day. (Witt-IPC)
W74-12927

WASTEWATER TREATMENT: PHYSICAL AND CHEMICAL METHODS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
F. A. DiGiano, and A. B. Scaramelli.
Journal Water Pollution Control Federation, Vol 46, No 6, p 1109-1121, June, 1974. 1 tab, 131 ref.

Descriptors: *Nutrient removal, *Organic compounds, *Colloids, *Waste water treatment, *Reviews, *Bibliographies, Nutrients, Coagulation, Carbon, Adsorption, Filtration, Reverse osmosis, Ion exchange, Ozone, Nitrogen, Phosphorus, Water pollution control, Costs, Operating costs, Pulp wastes, Pulp and paper industry, Industrial wastes, Waste treatment, Economics, Color.

The 1973 literature on physical-chemical methods for the removal of nutrients, biodegradable and nonbiodegradable organics, and colloidal suspensions from waste water is reviewed. Chemical coagulation, carbon adsorption, and filtration methods are discussed. The present stage of development of reverse osmosis, ion-exchange, and ozone processes for the removal of these substances is also covered. Chemical coagulation has been used, e.g., to decolor a kraft pulp mill effluent (by massive lime treatment), and reverse osmosis has successfully been used in paper mills as a means of concentrating effluent. Operating costs for the various treatment processes are given. (Witt-IPC)
W74-12934

WASTEWATER TREATMENT: ACTIVATED SLUDGE,
McKee (Arthur G.) and Co., San Mateo, Calif.
H. S. Azad, and C. L. Weddle.
Journal Water Pollution Control Federation, Vol 46, No 6, p 1123-1135, June, 1974. 124 ref.

Descriptors: *Reviews, *Bibliographies, *Activated sludge, *Waste water treatment, Industrial wastes, Phosphorus, Nitrogen, Nutrient removal, Design, Operations, Aeration, Oxygenation, Computer models, Mathematical models, Pulp wastes, Chemical wastes, Water pollution control, Waste treatment, Food processing industry.
Identifiers: Refinery wastes, Printing wastes, Cannery wastes.

The 1973 literature on the treatment of waste waters by the activated sludge process is reviewed. Topics discussed include: process innovations and applications; industrial waste water treatment; phosphorus and nitrogen removal; plant design and operation; aeration and oxygenation; and mathematical models and computer simulations of the activated sludge process. Refinery, pulp and paper, chemical, printing, and cannery wastes are cited as examples of some of the waste materials that are being treated by the activated sludge process. (Witt-IPC)
W74-12935

WASTEWATER TREATMENT: LAGOONS AND OXIDATION PONDS,
Kansas Univ., Lawrence.
C. E. Burkhead, and W. J. O'Brien.
Journal Water Pollution Control Federation, Vol 46, No 6, p 1135-1140, June, 1974. 71 ref.

Descriptors: *Reviews, *Bibliographies, *Lagoons, *Oxidation lagoons, *Waste water treatment, Industrial wastes, Municipal wastes, Aerobic treatment, Anaerobic digestion, Water pollution control.

A review is presented of the 1973 literature on the use of aerobic, anaerobic, and combination lagoons and oxidation ponds for the treatment of industrial and municipal waste waters. (Witt-IPC)
W74-12936

WASTEWATER TREATMENT: ANAEROBIC PROCESSES,
Institute of Gas Technology, Chicago, Ill.
S. Ghosh, and J. R. Conrad.
Journal Water Pollution Control Federation, Vol 46, No 6, p 1145-1161, June, 1974. 98 ref.

Descriptors: *Anaerobic digestion, *Reviews, *Bibliographies, *Waste water treatment, *Microbiology, Solid wastes, Municipal wastes, Industrial wastes, Energy, Cellulose, Degradation(Decomposition), Sulfur compounds, Organic compounds, Inorganic compounds, Reduction(Chemical), Anaerobic bacteria, Denitrification, Nitrogen fixation, Biodegradation, Wastes, Pulp wastes, Biochemistry.

This 1973 literature review on anaerobic processes covers the microbiology and biochemistry of some of the non-methanogenic processes including the mechanism of the following reactions: cellulose degradation; reduction of inorganic and organic sulfur compounds; photosynthetic and non-photosynthetic hydrogen production; anaerobic nitrogen fixation; and anaerobic denitrification. In the areas of process development and application, studies directed toward the development of anaerobic digestion-based systems capable of reclaiming the intrinsic energy content of municipal, industrial, and agricultural liquid and solid wastes are reviewed. (Witt-IPC)
W74-12937

WASTEWATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
R. I. Dick.
Journal Water Pollution Control Federation, Vol 46, No 6, p 1161-1181, June, 1974. 220 ref.

Descriptors: *Reviews, *Bibliographies, *Sludge treatment, *Sludge disposal, Sludge, Dewatering, Incineration, Nutrient removal, Industrial wastes, Drying, Water treatment, Ammonia, Nitrogen compounds, Phosphorus compounds, Pulp and paper industry, Pulp wastes, *Waste water treatment.

Literature published during 1973 on the management of sludge from waste water and water treatment plants is reviewed. The topics covered include: recovery of nutrients (such as ammonia, nitrate, phosphate) from sludge; handling, treatment, and disposal of industrial sludges (e.g., sludge from pulp and paper mill waste water treatment) and from water treatment plants; sludge constituents; conditioning; thickening; dewatering; combustion and heat drying; reclamation; and ultimate disposal. (Witt-IPC)
W74-12938

WASTEWATER TREATMENT: WATER RECLAMATION AND REUSE,
National Environmental Research Center, Cincinnati, Ohio.
I. J. Kugelman.
Journal Water Pollution Control Federation, Vol 46, No 6, p 1195-1201, June, 1974. 61 ref.

Descriptors: *Reviews, *Bibliographies, *Water reuse, *Reclaimed water, Planning, Irrigation, Groundwater recharge, Potable water, Industrial water, Waste water treatment, Municipal water, Water resources, Water conservation, Water utilization, Effluents, Pulp and paper industry.

A review is presented of the 1973 literature on water reclamation and reuse. It covers reuse in

water resources planning, industrial reuse of water (e.g., in the pulp and paper industry), reuse of treatment waste water for irrigation and groundwater recharge, indirect reuse of discharged waste waters (i.e., discharge of treated waste waters to rivers or lakes that are used as sources of water supply by other communities), direct potable reuse of renovated waste water, and advanced waste treatment technology for production of industrial water. (Witt-IPC)
W74-12939

WASTEWATER TREATMENT: LAND DISPOSAL OF WASTEWATER,
New York State Dept. of Environmental Conservation, Albany.
T. J. Tofflemire, and F. E. Van Alstyne.
Journal Water Pollution Control Federation, Vol 46, No 6, p 1201-1208, June, 1974. 96 ref.

Descriptors: *Reviews, *Bibliographies, *Waste water disposal, *Irrigation, Irrigation effects, Plant growth, Technology, Nutrients, Underground waste disposal, Waste disposal wells, Injection wells, Municipal wastes, Industrial wastes, Soil bacteria, Flood irrigation, Surface irrigation, Soil disposal fields, Anions, Cations.

A review is presented of the 1973 literature dealing with land disposal of waste waters. It covers general principles, individual systems (e.g., spray irrigation systems), technical aspects (such as the influence of waste water on cation and anion movement in the soil, buildup of sodium salts in the soil as a result of waste water disposal, criteria for operation and maintenance of irrigation and drainage systems, soil microbial activity), nutrient travel in the soil, and deep well disposal of waste waters. (Witt-IPC)
W74-12940

INDUSTRIAL WASTES: PAPER AND APPLIED PRODUCTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
G. W. Gove, and I. Gellman.
Journal Water Pollution Control Federation, Vol 46, No 6, p 1235-1280, June, 1974. 277 ref.

Descriptors: *Reviews, *Bibliographies, *Pulp and paper industry, *Waste water treatment, Water quality standards, Analytical techniques, Bioassay, Pulp wastes, Industrial wastes, Reverse osmosis, Ion exchange, Electrodialysis, Electrolysis, Byproducts, Sulfite liquors, Bark, Water conservation, Water reuse, Flotation, Oxidation, Ozone, Sludge disposal, Activated sludge, Aerated lagoons, Irrigation, Lime, Fly ash, Water pollution control, Color.
Identifiers: Chemical recovery, Ethyl alcohol, Sulfate soap, Flotation aids, White water, Black liquor, Biofiltration, Waste paper, Turpentine.

The 1973 literature on the treatment of wastes from the manufacture of pulp and paper and allied products is reviewed. Included are government policies (united States and foreign) regarding waste water treatment and water quality standards; sources and treatment of effluents in the pulp and paper industry; receiving waters and bioassay studies; chemical composition of pulping, bleaching, and miscellaneous mill effluents; chemical recovery from effluents via. reverse osmosis, ion-exchange processes, electrodialysis, and electrolysis; by-product recovery (including ethyl alcohol by fermentation of yeast on spent sulfite liquor, sulfate soap recovery from draft mill effluents, and bark); solids recovery from and renovation and reuse of pulping, bleaching, and papermaking effluents; reuse of municipal waste water treatment plant effluent for papermaking; color reduction of kraft pulp mill effluents by treatment with lime or fly ash or by ion-exchange processes; polishing treated mill effluents by filtration; flotation aids for improving the efficiency of white water clarification; weak black liquor oxidation, ozonation of pulp mill wastes, and stripping of turpentine decanter underflow and evaporator condensates; sludge handling and disposal; secondary effluent treatment (activated sludge, aerated stabilization basins, and biofiltration); waste disposal by land irrigation; and waste paper recycling. (Witt-IPC)
W74-12941

BIOCHEMICAL DEGRADATION BEHAVIOR OF SULFITE PULP MILL WASTE WATER AND ITS CONSTITUENTS (BIOCHEMISCHES ABBAUVERHALTEN VON SULFITZELLSTOFFABWASSER UND SEINEN INHALTSSTOFFEN),
For primary bibliographic entry see Field 5B.
W74-12942

ESTABLISHMENT OF A CLOSED SYSTEM FOR THE PAPERMAKING PROCESS,
Mo och Domsjo A.B., Ornskoldsvik (Sweden).
S. Martin-Lof, T. Franzen, C. Heinegard, C. Soremark, and D. Wahren.
Tappi, Vol 56, No 12, p 121-126, Dec 1973. 8 fig, 2 tab.

Descriptors: *Industrial water, *Recirculated water, Closed conduits, *Water reuse, Pulp and paper industry, *Water conservation, Environmental control, *Water pollution control, Pollution abatement, Recycling, Economics, Temperature, Operation and maintenance, Equipment, Monitoring, Waste water(Pollution), Slime, Drainage, Drainage practices, Suspended solids.
Identifiers: White water(Paper machine), Fourdrinier machines, Paper machines, Chemical consumption, Heat consumption, Paper products.

Environmental protection of waterways from paper mill discharges can be achieved by closing the white water circuit of paper machines. Swedish experience with a closed-system newsprint machine indicated that at least part of the normally discharged pollutants (fiber fragments, fillers, and dissolved wood components) can be recycled and included in paper products without detriment to their quality. Some paper properties, such as optical and mechanical characteristics, can actually be improved by thus retaining greater amounts of furnish components. Moreover, savings in fiber and heat consumption can amount to as much as $1 to $5 per ton of paper produced. Operating conditions of paper machines must, however, be carefully adjusted and monitored. Some of the necessary modifications, such as increased white water temperatures, can have beneficial effects, notably faster drainage of water from the fourdrinier wire and reduced slime problems. (Brown-IPC)
W74-12944

DECOLORIZATION OF KRAFT MILL EFFLUENT,
Rohm and Haas Co., Philadelphia, Pa.
D. C. Kennedy, and L. R. McConnell.
Southern Pulp and Paper Manufacturer, Vol 37, No 1, p 26-28, Jan 1974. 2 fig, 3 tab.

Descriptors: *Waste treatment, *Pulp wastes, *Bleaching wastes, *Color, *Adsorption, Costs, Capital costs, Operating costs, Softwood, Hardwood, Polymers, Resins, Organic compounds, Effluents, *Waste water treatment, Pulp and paper industry, Industrial wastes.
Identifiers: Amberlite resins.

Colored organic matter can be successfully removed from kraft pulp bleaching effluents by treatment with Amberlite XAD-8 adsorbent beads. A process flow diagram is shown for a system said to remove 66-78% of the color from softwood and 75-83% from hardwood pulp bleaching effluents. Estimates of capital and operating costs indicate economies superior to those of other currently used effluent-decoloring processes. (Hansen-IPC)
W74-12945

CLARIFICATION OF NSSC SPENT LIQUOR WITH ACTIVATED SLUDGE AND COAGULANTS (IN JAPANESE),
Hokkaido Univ., Sapporo (Japan). Chemical Utilization Lab.
O. Ebinuma, S. Satonaka, and M. Hanzawa.
Research Bulletins of the College Experiment Forests, Hokkaido University, Vol 30, No 1, p 183-203, 1973. 15 fig, 7 tab, 24 ref. (English summary).

Descriptors: *Sulfite liquors, Waste treatment, *Pulp wastes, *Waste water treatment, *Activated sludge, *Coagulation, Aluminum, *Lignins, Carbohydrates, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Hydrogen ion concentration, Nutrients, Microorganisms, Dissolved oxygen, Foreign research, Pulp and paper industry.
Identifiers: Aluminum sulfate, Aluminum chloride, Aluminum compounds, Japan, Coagulants.

A spent liquor from the neutral sulfite semichemical pulping of wood was subjected to activated sludge treatment and to coagulation with aluminum sulfate or chloride. The liquor contained 109.5-115.3 g of total solids, 30.5-32.3 g of ash (minerals), 435 g of COD, and 363 g of BOD per liter and had a pH of 6.60-7.25. Acclimatization of the sludge was completed within 8 days, at which time Vorticella, Carchesium, and Rotaria were the dominant microorganisms. With increased BOD loading from 1000 to 2400 mg/liter, the BOD removal efficiency decreased from 83% to 66% at a BOD:N:P ratio of 80:5:1. Carbohydrates were almost quantitatively removed in 3 hr, but only 12% of the lignin was removed even after 22 hr. The pH rose from 7.25 to 8.10 within 2 hr, then dropped gradually to 7.60. Dissolved oxygen decreased from 7.6 to 1.6 ppm within 1 hr, then increased to 6.85 ppm after 22 hr, indicating rapid bio-oxidation during the initial treatment stage. The addition of aluminum sulfate (0.00522 M/g of lignin) to the untreated liquor (at pH 4.5) or to the biologically treated liquor (at pH 5.5-6.0) removed up to 46% of the lignin. Aluminum chloride was less effective; a similar dose removed 43% of lignin from the untreated but only 34% from the biologically pretreated liquor. (Brown-IPC)
W74-12946

MICROBIOLOGICAL PURIFICATION OF HYDROGEN SULFIDE CONTAINING WASTE WATERS FROM SULFATE PULP PRODUCTION (MIKROBIOLOGICHESKAYA OCHISTKA SEROVODORODNYKH STOCHNYKH VOD SULFATNOTSELLYULOZNOGO PROIZVODSTVA),
N. I. Tkachenko, and L. B. Pomerants.
Prikladnaya Biokhimiya i Mikrobiologiya, Vol 8, No 5, p 569-573, 1972. 2 fig, 1 tab, 18 ref. (English summary).

Descriptors: *Waste water treatment, *Sulfur compounds, *Hydrogen sulfide, *Sulfides, *Pulp wastes, Waste treatment, *Filtration, *Biological treatment, Microorganisms, Bacteria, *Sulfur bacteria, Effluents, Sulfur, Hydrogen ion concentration, Foreign research.
Identifiers: Kraft pulp mills, Thiobacillus thiooxidans, Thiobacillus thioparus, Soviet Union(USSR), Digester condensates.

In continuation of earlier studies on the removal of hydrogen sulfide from digester exhaust condensates and other kraft mill waste waters, laboratory experiments were conducted on the effects of biological filters on model effluents containing sodium sulfide and ammonium sulfate as nitrogen source. Samples were analyzed for microfloral composition, redox potential, pH, rH, and S compounds before and after passage through the filter. An initial increase in counts of saprophytic bacteria and Thiobacillus thioparus during filter formation was accompanied by drastic reduction in hydrogen sulfide and increased sulfate contents.

The Th. thioparus count reached a maximum after about one month, but other sulfur bacteria (such as Th. thiooxidans and sulfur-reducing bacteria) were absent at Ph above 7.6. Since elementary sulfur was retained on the filter slag, no S was contained in the purified effluent during the filter-forming stage. Later, the bacterial film was mechanically washed away, along with elementary S, so that the latter could be recovered and recycled to the cooking liquor preparation stage. A sulfur material balance for 80 days of biological filtration is tabulated. (Stapinski-IPC)
W74-12949

INDUSTRIAL WASTE DISPOSAL MADE PROFITABLE,
Toledo Univ., Ohio.
G. F. Bennett, and L. Lash.
Chemical Engineering Progress, Vol 70, No 2, p 75-85, Feb 1974. 5 fig, 5 tab, 71 ref.

Descriptors: *Byproducts, *Pulp wastes, *Industrial wastes, Waste treatment, *Waste water treatment, Liquid wastes, *Sulfite liquors, *Yeasts, *Proteins, *Fermentation, Microorganisms, Alcohols, Economics, Food processing industry, Chemical wastes, Chemical industry.
Identifiers: Sulfite alcohol, Ethanol(Ethyl alcohol), Spent pulping liquors, Spent sulfite liquor.

Many industrial waste streams can be regarded as misplaced natural resources having latent potentials for recovery of saleable byproducts. Numerous successful recovery applications in various industries, including the food and chemical industries, are cited as illustrations. Methods of waste water purification for reuse are also discussed. Specific mention is made of the microbiological fermentation of spent sulfite pulping liquors for production of yeast and ethyl alcohol ('sulfite alcohol'). (Hansen-IPC)
W74-12951

SAVING ENERGY THROUGH RECYCLING PAPER MILL PROCESS WATER,
L. J. Eimmerman.
American Paper Industry, Vol 56, No 4, p 20-22, April 1974. 2 fig.

Descriptors: *Water conservation, *Water consumption(Except consumptive use), *Industrial water, Freshwater, *Recirculated water, *Pulp and paper industry, *Waste water treatment, Treatment facilities, *Wisconsin, United States, Heat balance, Heat, *Energy, Energy loss, *Recycling.
Identifiers: Paper machines, White water, Deinking, Waste paper.

A systematic mill-wide water conservation program at Wisconsin Tissue Mills in Menasha, Wisconsin, managed to reduce freshwater consumption from about 2.3 to 1.3 million gallons per day, in addition to saving thermal energy of about 3,750,000 Btu/hr or 3750 lb of steam per hour. A recently completed waste water treatment installation is expected to decrease the mill's water consumption to 0.75 million gal/day. The engineering surveys and calculations of water flows and water balances that led to these drastic improvements included both of the mill's paper machines and its waste paper deinking plant. Illustrative diagrams of these schemes are presented. Some of the problems that had to be overcome during the water conservation drive, as well as those that may arise from further freshwater saving measures, are indicated. (Wise-IPC)
W74-12952

NIC TREATMENT SYSTEM FOR WASTE DISPOSAL OF FLEXO INK AND STARCH.
Japan Corrugated Board and Box Inst., Tokyo.
Japan Pulp and Paper, Vol 11, No 2, p 50-52, July 1973. 1 tab.

Descriptors: Waste treatment, *Waste water treatment, *Pulp wastes, *Sludge treatment, Treatment facilities, Chemical precipitation, *Coagulation, *Flocculation, Recirculated water, *Water reuse, *Industrial water, Water conservation, Foreign research, Industrial wastes, Chemical wastes, Biochemical oxygen demand, Chemical oxygen demand, Sedimentation, Suspended solids, Filters, Filtration, Dewatering, Carbohydrates, Adhesives.
Identifiers: Starch, Corrugated boxes, Corrugated boards, Starch paste, Inks, Printing inks, Flexographic inks, Wash water, Converting plants(Paper), Ferric chloride, Japan.

A chemical treatment system for corrugated box factory waste waters has been developed in Japan. Effluents containing corrugating starch paste and flexographic printing ink wastes are combined, flocculated and precipitated with ferric chloride, calcium or sodium hydroxide, and/or organic coagulant aids. The clarified waste water is recycled and reused for preparation of more starch paste and as wash-up water for the flexographic printing presses. The sedimented sludge is chemically conditioned and dewatered, using a patented NTS filter. The treatment system is said to remove 82% of suspended solids, 97% of COD, and 96.4% of BOD from the waste water at reasonable costs for chemicals and power consumption. Some cost data are given, along with an outline description of the process. (Witt-IPC)
W74-12954

BIOLOGICAL REMOVAL OF LIGNIN FROM KRAFT MILL EFFLUENTS: CHANGES IN MOLECULAR SIZE DISTRIBUTION,
Toronto Univ. (Ontario).
T. I. Obiaga, and J. Ganczarczyk.
Tappi, Vol 57, No 2, p 137-138, Feb 1974. 2 fig, 1 tab, 2 ref.

Descriptors: *Lignins, *Biological treatment, *Pulp wastes, *Molecular structure, *Chemical oxygen demand, *Color, *Waste water treatment, Waste treatment, Pulp and paper industry, Effluents, Biomass.
Identifiers: Black liquors, Alkali lignins, Kraft mills, Molecular weight.

The activated sludge treatment of simulated kraft mill effluents (diluted black liquors) resulted in significant reductions of COD, nitrosolignin color, and visible color. In typical effluents, the molecular weight distribution of lignin did not change appreciably. In about 10% of the effluents, which were considered atypical or abnormal, the molecular weight increased along with decreases in color and COD removals. The biological removal of alkali lignin is thought to occur largely through sorption or bridging action on biomass. (Buchanan-IPC)
W74-12957

INTENSIFICATION OF SAND FILTER OPERATION (INTENSIFIKATSIYA RABOTY PESCHENYKH FIL'TROV),
All-Union Research Inst. for the Paper Industry, Astrakhan (USSR).
G. A. Romanov, G. P. Kuchin, Yu. M. Smirnov, and A. E. Perednya.
Bumazhnaya Promyshlennost', No 1, p 14-15, Jan 1974. 2 fig, 1 tab.

Descriptors: *Filtration, *Filters, *Clogging, Treatment facilities, *Pulp wastes, *Waste water treatment, Waste treatment, *Industrial water, Operation and maintenance, Pulp and paper industry, Effluents, Lignins, Organic acids, Soaps, Lipids, Pressure, Pressure head, Pressure conduits, Piping systems(Mechanical), Sands, Gravels, Recirculated water, Water reuse.
Identifiers: Kraft pulp mills, Tall oil, Sulfate soap, Rosin acids, Wash water(Shower water), *Sand filters, USSR.

Earlier studies had shown that the filtration of pretreated (chemically and biologically purified) kraft mill effluents through sand yields water suitable for industrial reuse. However, the passage of chemically pretreated effluent resulted in the formation of a thin film on the filter surface, caused by gradual accumulation of lignin, tall oil, sulfate soap, rosin acids, and fatty acids. As a consequence, the density of this surface deposit increased to the extent that, after 3-4 months of operation, it could no longer be removed by conventional washing. Special washing equipment was, therefore, developed. It consists essentially of a system of water-distributing pipes and a series of washing caps with openings through which the wash water is delivered under pressure. Operating tests indicated that an adequate pressure (at least 10 m of water column for effluents containing up to 30 mg/liter of suspended solids) will fracture the surface films into small particles that are readily washed away. (Stapinski-IPC)
W74-12958

FINAL PURIFICATION OF BIOCHEMICALLY TREATED EFFLUENTS FROM WOOD ROSIN EXTRACTION FACTORIES (DOOCHISTKA BIOKHIMICHESKI OCHISHCHENNYKH STOKOV KANIFOL'NO-EKSTRAKTSIONNOGO PROIZVODSTVA),
Tsentralnyi Nauchno-Issledovatelski Lesokhimicheski Institut, Khimki (USSR).
A. I. Firsov, N. P. Drozdov, and V. P. Malev.
Gidroliznaya i Lesokhimicheskaya Promyshlennost', No 1, p 6-7, 1974. 2 fig, 3 tab, 1 ref.

Descriptors: *Activated carbon, Water treatment, *Waste water treatment, *Color, *Odor, Taste, *Industrial wastes, Potable water, Water purification, *Adsorption, Recycling, Effluents, Waste treatment, Steam, Particle size, Wood waste.
Identifiers: Rosin, Silvichemicals, Naval stores, Wood rosin, USSR.

Adsorption on activated carbon was found to remove color, malodor, and unpleasant taste from the biochemically treated waste waters of wood rosin extraction factories. The purified water was suitable for potable water supplies of population centers. The spent carbon could be regenerated by treatment with superheated steam at 650-700C. The purification degree was independent of the number of regenerative cycles and nearly independent of the carbon particle size between 0.5 and 3.0 mm. (Stapinski-IPC)
W74-12960

REDUCTION OF WASTE WATER POLLUTION IN PAPERBOARD MILLS (SNIZHENIE ZAGRYAZNENIYA STOCHNYKHVOD NA KARTONNYKH FABRIKAKH),
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev (USSR).
N. A. Gavrishova, T. A. Dudarenko, V. P. Svitelskii, V. A. Kovba, and S. A. Lashchenko.
Bumazhnaya Promyshlennost', No 1, p 15-16, Jan 1974. 1 fig, 2 tab.

Descriptors: *Pulp wastes, Waste water(Pollution), Waste treatment, *Waste water treatment, *Coagulation, *Flocculation, Chemical precipitation, *Industrial water, *Recirculated water, Water conservation, *Polymers, *Polyelectrolytes, Microorganisms, Slime, Aluminum, Aquatic microorganisms, Bacteria, Fungi, Pulp and paper industry, Foreign research, Water reuse.
Identifiers: Aluminum sulfate, Polyacrylamide, White water, Board mills, Paper machines, Paper mills, Board machines, Closed systems.

Flocculants, such as aluminum sulfate, and coagulants, such as polyacrylamide, make it possible to clarify and reuse paper-machine white waters and, ultimately, to close the water circuits of paper and board mills, especially those producing coarser grades of papers and paperboards. The effect of

these two chemicals on micro-organism counts in purified mill effluents was investigated in laboratory tests. Board mill effluents sedimented without aid of chemicals contained large numbers of heterotrophic bacteria (1,400,000/ml) and of microscopic fungi (2,200/ml); these numbers increased rapidly during sedimentation. Addition of 180 mg aluminum sulfate 5 mg polyacrylamide per liter substantially reduced the counts of bacteria (by 62-99%) and of fungi (by 69-93%). This would indicate a minimization of slime deposit formation in case of recirculation of purified white water. (Stapinski-IPC)
W74-12961

PURIFICATION OF HYDROLYSIS PLANT EFFLUENTS FROM CARBOHYDRATES (OCHISTKA STOCHNYKH VOD GIDROLIZNYKH ZAVODOV OT UGLEVODOV),
E. E. Drublyanets, and N. A. Skachkova.
Gidroliznaya i Lesokhimicheskaya Promyshlennost', No 1, p 4-5, 1974. 4 tab, 4 ref.

Descriptors: Waste treatment, *Carbohydrates, *Activated sludge, *Biodegradation, Microorganisms, *Industrial wastes, *Waste water treatment, Water analysis, *Chromatography, *Oxidation, *Hydrolysis, *Wood wastes, *Farm wastes.
Identifiers: Agricultural residues, Oligosaccharides, Arabinose, Monosaccharides, Uronic acids.

Carbohydrates (mono- and oligosaccharides and uronic acids) were identified and determined by chromatographic analysis in effluents from two Soviet hydrolysis plants, one processing wood wastes, the other agricultural residues, before and after activated sludge treatment. The biochemical treatment rapidly oxidized all carbohydrates except arabinose and its oligomers, which were not assimilated by the sludge microorganisms and only incompletely oxidized even under optimized treatment conditions. (Stapinski-IPC)
W74-12963

EFFLUENTS FROM WASTE PAPER STOCK CLEANING (SCIEKI PO OCZYSZCZANIU MASY MAKULATUROWEJ),
Instytut Celolozowo-Papierniczy, Warsaw (Poland).
For primary bibliographic entry see Field 5B.
W74-12972

PLANNING METHODOLOGY FOR THE DESIGN OF REGIONAL WASTE WATER TREATMENT SYSTEMS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
E. F. Joeres, J. Dressler, C-C. Cho, and C. H. Falkner.
Water Resources Research, Vol 10, No 4, p 643-649, August 1974. 9 fig, 1 tab, 16 ref.

Descriptors: *Waste water treatment, *Computer models, *Alternative planning, *Decision making, *Economies of scale, Optimization, Treatment facilities, Regional analysis, Methodology, Design, Pipes, Networks, Costs, Algorithms, Evaluation, Wisconsin, Equations, Mathematical models, Systems analysis.
Identifiers: *Cost minimization, *Mixed integer programming, Environmental impact.

A computer model is developed to select an optimal regional waste water treatment system, given prior definition of all reasonable interceptor routes connecting individual communities, local treatment plant sites, and associated maximum discharge potentials. The model considers the trade-off between economies of scale inherent in waste water treatment plants and added pipe network collection costs. Utilizing mixed integer programming, the model relies on piecewise linear approximations of concave cost curves and incorporates capacity limits dictated by maximum tolerable environmental impact at potential treatment plant sites. The objective is to minimize total regional cost while satisfying demands for waste water service, without violating the tolerable environmental impact limits. Pipe cost functions are assumed to be continuous as a function of flow, all generated waste water is assumed to be generated at point sources, and maximal capacities chosen for individual plant sites are based on a uniform treatment efficiency of 85%. Cost savings are found possible for the central region of Dane County, Wisconsin. (Bell-Cornell)
W74-13018

INDUSTRIAL ECONOMIC MODEL OF WATER USE AND WASTE TREATMENT FOR AMMONIA,
Houston Univ., Tex.
J. A. Calloway, A. K. Schwartz, Jr., and R. G. Thompson.
Water Resources Research, Vol 10, No 4, p 650-658, August 1974. 7 fig, 5 tab, 9 ref, 2 append. NSF GI-34459.

Descriptors: *Water quality control, *Industrial wastes, *Ammonia, *Water policy, *Waste treatment, *Linear programming, *Economics, Waste water treatment, Water utilization, Optimization, Costs, Effluents, Taxes, Standards, Marginal costs, Prices, Evaluation, Mathematical models, Systems analysis.
Identifiers: *Ammonia plants, Water withdrawal, Cost minimization.

A linear programming model is developed to evaluate the effects of different policies on: the production and treatment of dissolved and suspended solids produced by an ammonia plant; the use of water in ammonia production; and the cost of ammonia. Solution of the model for each specified policy yields the least-cost ammonia production process, the marginal costs of the resource limitations, and the cost of water use and waste water treatment. The effect of systematically decreasing each effluent standard to zero is evaluated, and the effect of increasing the water price on water withdrawals is determined. Results are: (1) zero discharges of suspended solids, heat, and total dissolved solids increased production costs 3.8% with injection wells; (2) an effluent tax of 3.6 cents/lb dissolved solids will reduce dissolved solid discharges 95%, and an effluent tax of 29.5 cents/lb dissolved solids will reduce the discharges 100%; (3) a water withdrawal price of 3.2 cents/1000 gal. will reduce water withdrawals 95%; and (4) zero discharge of residuals and high water prices increase production costs less than 4%. The modeling has been done for a newly designed plant; both naphtha and natural gas feedstocks were evaluated. (Bell-Cornell)
W74-13020

DYNAMIC ANALYSIS AND OPTIMAL FEEDBACK CONTROL SYNTHESIS APPLIED TO BIOLOGICAL WASTE TREATMENT,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
L. T. Fan, P. S. Shah, N. C. Pereira, and L. E. Erickson.
Water Research, Vol 7, No 11, p 1609-1641, November 1973. 16 fig, 49 ref, 2 append.

Descriptors: *Water quality control, *Waste treatment, *Biological treatment, *Effluents, *Model studies, Control, Optimization, Computers, Simulation analysis, Algorithms, Equations, Operations research.
Identifiers: *Feedback control, Kinetic models, Flow models, Influent flow rate, Substrate concentration, Material balance.

The dynamics and optimal feedback control of biological waste treatment processes are examined. Modern feedback control theory is applied and results are obtained for both proportional and proportional plus integral control. A dynamic mathematical model of the system is developed by using a Monod kinetic model, which is modified to account for endogenous metabolism, and a complete mixing flow model in the growth chamber. Extensive computer simulations are used to gain a thorough knowledge of the system's responses to external disturbances or to changes in the system's operation. The feedback control is implemented via the flow rate so as to maintain desired effluent concentrations. External disturbances causing changes in substrate concentration and/or cell concentration are considered and optimal control effort is applied. Results are also presented for impulse and step changes in the influent substrate concentration. By changing the values of the weighting factors in the objective function, it is possible to obtain good control of either the effluent substrate concentration or cell concentration. (Bell-Cornell)
W74-13026

FLOW-MEASURING FLUME FOR WASTEWATER FOR TREATMENT PLANTS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
W. R. Walker, G. V. Skogerboe, and R. S. Bennett.
J Water Pollut Control Fed. Vol 45, No 3, Part 1 p 542-551, 1972. Illus.

Descriptors: *Flumes, *Waste water treatment, Water measurement, Flow measurement.
Identifiers: Cut-throat flume.

A flat-bottomed, rectangular cut-throat flume can be used successfully in wastewater treatment plants. Generalized ratings for the structure based on a comprehensive flow analysis technique were devised. These allow a broad flexibility in design. The cut-throat flume has numerous advantages over traditional flow measuring devices, such as low fabrication costs, adaptability in existing facilities, upstream velocity control characteristics and acceptable measuring accuracy in either the subcritical or supercritical flow regime. A theoretical basis for a self-compensating recording system for recording flows in the subcritical condition is given with specific application to the cut-throat flume.--Copyright 1973, Biological Abstracts, Inc.
W74-13032

EPIZOIC ALGAE IN SEWAGE WATERS, (IN RUSSIAN),
Kharkov State Univ. (USSR).
For primary bibliographic entry see Field 5B.
W74-13041

OPTIMAL REGIONALIZATION OF WASTEWATER TREATMENT FOR WATER QUALITY MANAGEMENT,
Illinois Univ., Urbana. Dept. of Civil Engineering.
L. A. Rossman, and J. C. Liebman.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 410 $7.00 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 89, July 1974. 198 p, 12 tab, 26 fig, 66 ref, 2 append. OWRT A-063-ILL(1), 14-31-0001-4013.

Descriptors: *Waste water treatment, *Mathematical models, Water quality, *Optimization, *Regional analysis, Costs, Treatment facilities, Model studies, Piping systems(Mechanical), Cost analysis.
Identifiers: Regional systems, *Cost minimization, Nonlinear programming.

A mathematical decision model is developed which determines how a group of waste dischargers should regionalize their treatment facilities and the amount of treatment each facility should provide so that the cost of achieving a specified water quality goal is minimized. The waste dischargers are assumed to lie in a linear configuration along (or on both sides of) the river and several other regionalization restrictions are im-

posed. Treatment plant and piping costs as functions of wasteflow can be of any form and may include fixed costs. The model is solved by using a dual approach to nonlinear programming and is applied to data from the Delaware Estuary. The results compare favorably with previous regionalization shemes. The model is extended to consider branched systems and the use of bypass piping. Two additional minimum cost, regional wastewater treatment models are developed; one which finds the regional treatment facility pattern when degree of treatment is fixed and another which finds the regional facility pattern and uniform level of treatment for all facilities so that a water quality goal is met.
W74-13048

CONCENTRATION OF INDUSTRIAL WASTE BY DIRECT OSMOSIS,
Rhode Island Univ., Kingston. Dept. of Chemical Engineering.
F. Votta, Jr.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 468 $3.25 paper copy, $2.25 in microfiche. Completion Report, July 1974. 15 p, 3 tab, 12 ref. OWRT A-049-RI(1). 14-31-0001-4040.

Descriptors: *Osmosis, *Industrial wastes, *Feasibility studies, *Waste water treatment, *Membrane processes, Penetration, Permeability, Reverse osmosis.

A study has been made of the feasibility of using direct osmosis at atmospheric pressure as a means of concentrating dilute industrial wastes. Waste solutions were concentrated by the permeation of water through an osmotic membrane to sea water, whose osmotic pressure was less than that of the waste solutions. None of the commercially available reverse osmosis membranes tested were found suitable. The water permeation rates were low, less than 3 gal/sq.ft./day, and the salt rejection was poor. The concentrated waste solutions were contaminated by an appreciable quantity of sodium chloride and relatively large quantities of metallic ions were lost in the diluted sea water during the concentration of metallic waste solutions.
W74-13055

CONDITIONS FOR DISCHARGE INTO A BODY OF WATER OF PROMETRINE PRODUCTION EFFLUENTS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (USSR). Dept. of Public Hygiene.
L. N. Gabrilevskaya, and V. P. Laskina.
Gig Sanit. Vol 37, No 3, p 18-21, 1972, English summary.
Identifiers: *Prometrine, Sewage, Propazine, Sodium methylmercaptide, Sodium methylsulfonate, *Waste water treatment.

The composition of the effluents was studied and hygienic substantiation was made of the maximal permissible concentration of specific ingredients of this liquid (prometrine, propazine, sodium methylmercaptide, sodium methylsulfonate). Comparative features are noted of effluents before and after their treatment by the chemical process suggested by the enterprise. The suggested method of treatment of the discharged waters was unfit for widespread use.--Copyright 1973, Biological Abstracts, Inc.
W74-13065

WASTEWATER SYSTEM ALTERNATES: WHAT ARE THEY...AND WHAT COST,
Anderson-Nichols and Co., Boston, Mass. Environmental Sciences Div.
R. P. Monti, and P. T. Silbermann.
Water and Wastes Engineering, Vol 11, No 3, p 32-36, March, 1974. 5 fig.

Descriptors: *Water quality standards, *Waste disposal, *Waste water treatment, *Waste treatment, Water treatment, Waste dilution, Sewage treatment, Activated carbon, Waste water, Water pollution, Water quality, Adsorption, Industrial wastes, Municipal wastes, Standards, Pollution abatement.
Identifiers: *Biological treatment, *Physical-chemical treatment, EPA standards(1977), Pollution control deadlines.

This first article of a four-part series outlines wastewater techniques which could be used to cope with the 1977, 1983, and 1985 federal pollution control deadlines. By 1977, publicly-owned waste treatment facilities must discharge effluent equal to or better than secondary treatment standards specified by EPA. Secondary treatment can be achieved through biological and physical-chemical (p-c) methods, but p-c treatment has gained favor recently, especially chemical precipitation and settling, filtration, and for higher treatment, activated carbon adsorption. P-c plants seem to be more reliable and their effluent is more uniform that that from biological plants, since chemical processes are more predictable than biological ones. Energy requirements are also less for p-c plants since aeration equipment is not used. However, p-c plants have higher operating costs because of large chemical and activated carbon costs, and their sludges pose a greater disposal problem because of the chemical content. P-c plants do not remove major wastewater components such as ammonia, and it is questionable whether wastewater should be treated with chemicals when the same treatment levels can be attained biologically, with oxygen. (See also W74-10290 and W74-13072) (Grden-North Carolina)
W74-13071

WASTEWATER SYSTEM ALTERNATES: WHAT ARE THEY...AND WHAT COST,
Anderson-Nichols and Co., Boston, Mass. Environmental Sciences Div.
R. P. Monti, and P. T. Silbermann.
Water and Wastes Engineering, Vol 11, No 6, p 52-56, June, 1974. 1 tab, 3 fig.

Descriptors: *Demineralization, *Water quality standards, *Ion exchange, *Reverse osmosis, *Waste water treatment, Waste disposal, Waste treatment, Water treatment, Waste dilution, Waste water, Water pollution, Water quality, Standards, Pollution abatement, Municipal wastes, Industrial wastes, Water purification, Distillation.
Identifiers: *Pollution control deadlines, EPA standards(1985).

Federal law specifies that by 1985, there must be zero discharge of pollutants, and this final article of a four-part series discusses methods for attaining that standard. Demineralization of wastewater has been practiced for years by a technique utilizing a positive and negative ion exchange process. While this process has an 85 to 95% efficiency or higher, it does generate a considerable amount of waste brines with high mineral content that are difficult to dispose of. This method is also costly, and it is doubtful that any new technology will lower the costs. Reverse osmosis (RO) is presented as a more feasible alternative, and it can remove 85 to 90% of dissolved minerals in wastewater. Its development is in the infancy stage, so its operation will probably become more efficient and costs will decrease. The RO process can also tolerate higher organic wastewater loadings than can ion exchange without experiencing operating problems. In situations where ultrapure water approaching distilled water is required, a system including RO and ion exchange appears to be feasible, and the combined demineralization efficiency would be greater than 98%. (See also W74-13071) (Grden-North Carolina)
W74-13072

QUARTERLY PROGRESS REPORT STUDIES ON MANAGEMENT OF SELECTED WASTES - JANUARY THROUGH MARCH 1974.
Battelle-Pacific Northwest Lab., Richland, Wash. Nuclear Waste Technology Dept.
Available from NTIS, Springfield, Va., 22161, as BNWL-1825, $4.25/copy; $2.25 microfiche. Report No. BNWL-1825, April 1974. 58 p, 7 fig, 14 tab, 15 ref.

Descriptors: *Management, *Waste treatment, *Radioactive waste disposal, *Research and development, Water pollution treatment, Analytical techniques, Solvent extractions, Tritium, Reviews.

Progress is reported on decontamination and densification of chop leach cladding residues. A literature review of aqueous, molten salt, and melt flux decontamination processes has indicated that waste stream minimization, ease of operation, and decontamination efficiency can probably be optimized by a modified aqueous decontamination process followed by melting. The reuse of metal from decontamination would be possible after long cooling times. Studies on waste treatment and handling processes continued. Equipment required for scoping studies on pyrolysis of wastes was fabricated and installed. Experimental plans for the scoping studies were completed and experiments at 700C using six different waste components were conducted. Solvent extraction studies have shown that competitive factors negate most of the separation which might be expected. A few studies are continuing using strongly basic solvents. Tritium separation and fixation continue to offer problems. (See also W74-13107 thru W74-13109) (Houser-ORNL)
W74-13106

DECONTAMINATION AND DENSIFICATION OF CHOP-LEACH CLADDING RESIDUES,
Battelle-Pacific Northwest Lab., Richland, Wash. Nuclear Waste Technology Dept.
R. L. Dillon, and R. S. Kemper.
In Report No. BNWL-1825, p 3-18, April 1974. 7 tab, 11 ref.

Descriptors: *Management, *Radioactive waste disposal, *Waste treatment, *Solids, Fuels, Alloys, Metals, Absorption, Tritium, Nuclear power plants.

Fuel element cladding residues from the chop-leach head end process constitute a low density, high surface area metallic waste with a substantial actinide element contamination. The objective of this study is to determine the feasibility of and to develop method for removal of long half-life transuranics from the cladding residues and for consolidation of the zirconium and stainless steel residues. The study involves: (1) Selection and laboratory testing of methods for transuranic removal. (2) Consolidation of the fuel element hulls by melting and casting Zircaloy, stainless steel, Inconel or alloys of the three. (3) Testing and evaluating the consolidated fuel hulls for long-term waste management. (4) Absorption and fixation of tritium into the waste ingots. (5) Consolidation of transuranics removed. (See also W74-13106) (Houser-ORNL)
W74-13107

WASTE TREATMENT AND HANDLING PROCESSES,
Battelle-Pacific Northwest Lab., Richland, Wash. Nuclear Waste Technology Dept.
V. L. Hammond.
In Report No. BNWL-1825, p 19-35, April 1974. 7 fig, 5 tab.

Descriptors: Research and development, Management, *Radioactive waste disposal, *Solid wastes, *Waste treatment, Waste storage, Assessment, Safety, Evaluation, Nuclear powerplants.
Identifiers: *Alpha wastes, Low-level wastes, Pyrolysis.

The principal objective is to evaluate current practice and to develop alternative processes for safe and economical volume reduction of low-level contaminated solid wastes (alpha wastes) from 10- to 50-fold as a precursor to long-term storage and/or disposal. This objective will be pursued via (1) a phased program of bench-scale research activities leading to and supporting experimental-facility development activities; and (2) by systematic and continuing analytical studies to assess developments in current practice for alternative, candidate techniques for processing alpha wastes prior to long-term storage and/or disposal. The experimental program will initially emphasize pyrolysis as a means for reducing the volume (and weight) of combustible solid wastes. (See also W74-13106) (Houser-ORNL)
W74-13108

TRITIUM SEPARATION AND FIXATION,
Battelle-Pacific Northwest Lab., Richland, Wash. Nuclear Waste Technology Dept.
L. L. Burger.
In Report No. BNWL-1825, p 36-44, April 1974. 2 tab, 4 ref.

Descriptors: *Research and development, *Radioactive waste disposal, *Tritium, *Analytical techniques, *Solvent extractions, Separation techniques, Assay, Assessment, Evaluation.
Identifiers: *Fixation, *Molecular excitation, Concentration.

The objectives are to identify potential tritium separations methods and methods of fixing the tritium in forms suitable for storage. The separations study aims to calculate separative work and costs in terms of separation parameters to identify overall separation needs. Solvent extraction, molecular excitation, and other techniques that appear attractive are to be evaluated in experimental tests. The fixation study will define the concentrations and amounts of tritiated water wastes and examine methods of immobilizing HTO for permanent storage. (See also W74-13106) (Houser-ORNL)
W74-13109

RELEASES OF RADIOACTIVITY IN EFFLUENTS AND SOLID WASTE FROM NUCLEAR POWER PLANTS IN 1972.
Oak Ridge National Lab., Tenn. Nuclear Safety Information Center.
For primary bibliographic entry see Field 5B.
W74-13125

EFFLUENT CONTROL IN FUEL REPROCESSING PLANTS,
Oak Ridge National Lab., Tenn.
O. O. Yarbro, F. E. Harrington, and D. S. Joy.
Available from USAEC Tech. Inf. Center, Oak Ridge, Tenn., $5.45/copy, $2.25/microfiche. Report No ORNL-TM-3899, March 1974. 64 p, 4 fig, 13 tab, 3 ref, append.

Descriptors: *Management, *Nuclear powerplants, *Fuels, *Effluents, Technology, *Waste treatment, Control systems, Wastes, Ventilation, Environment, Safety, Research and development, Tritium, Krypton, Iodine, Model studies.
Identifiers: *Fuel reprocessing, Containment.

Summarized is a study of how extrapolations of current and developing technology might be applied to the task of reducing radioactive effluents from future fuel reprocessing plants to 'near zero.' The study has indicated that very significant reductions of effluents can be achieved by integrating advanced effluent control systems with new concepts of containment and ventilation that would reduce net inleakage of air to the process enclosures and provide for extensive recycle of gases and liquids. If net plant effluent flow rates can be thus reduced and if the highly efficient fission product removal systems, under development, become available, it should be possible to reduce the discharge of activity to the environment in future plants by four to six orders of magnitude. (Houser-ORNL)
W74-13127

CHEMICAL ENGINEERING DIVISION WASTE MANAGEMENT PROGRAMS QUARTERLY REPORT, OCTOBER-DECEMBER 1973,
Argonne National Lab., Ill.
M. J. Steindler, N. M. Levitz, L. E. Trevorrow, T. J. Gerding, and B. J. Kullen.
Available from NTIS, Springfield, Va. 22161 as ANL-8087, $3.75/copy, $2.25/microfiche. Report No ANL-8087, February 1974. 45 p, 3 fig, 7 tab, 144 ref, append.

Descriptors: *Management, *Nuclear wastes, *Waste treatment, *Evaluation, Osmosis, Membrane processes, Separation techniques, Plutonium, Tritium, Compressibility, Pressure, Research, *Reverse osmosis.
Identifiers: *Fuel reprocessing wastes.

Metal-compaction methods have been reviewed and information on the irradiation-induced property changes of Zircaloy surveyed as part of a study on the handling of fuel cladding hulls. Information originating from AEC-site visits and from a review of the open literature concerning decontamination of plutonium-contaminated materials is presented. The technical and economic feasibility of adapting reverse osmosis to the concentration of tritium from tritiated fuel reprocessing wastes was briefly evaluated. Technical feasibility was assumed from literature reports of a difference of about 3% in the self-diffusion coefficients of THO and water, and possibly greater differences in transport rates in solution-diffusion membranes. The costs of such a process were calculated from (1) estimates for the single-stage separation factor, (2) the heads flow rate for assumed concentrations and volumes of feed, product, and waste in an ideal cascade of membranes, and (3) published costs for reverse osmosis equipment. (Houser-ORNL)
W74-13128

AQUEOUS PROCESSING OF LMFBR FUELS TECHNICAL ASSESSMENT AND EXPERIMENTAL PROGRAM DEFINITION SECTION 4.4 AND 5.4.
Oak Ridge National Lab., Tenn.
Available from NTIS, Springfield, Va, as ORNL-4436 (Suppl 1), $3.75/copy, $2.25/microfiche. Report No ORNL-4436, Supplement 1, June 1972. J. H. Goode and S. D. Clinton, Compilers. 48 p, 3 fig, 105 ref.

Descriptors: *Radioactive waste disposal, *Separation techniques, *Solutions(Aqueous), *Volatility, *Gases, Tritium, Iodine, Xenon, Krypton, Fuels, Waste storage, Waste treatment.

Investigations are described into a new head-end processing step that has the potential of removing volatile fission products as gases prior to aqueous processing. The objective of this step, which has been termed 'voloxidation,' is to volatile and remove tritium, iodine, xenon, and krypton from the sheared fuel and blanket materials for trapping and ultimate storage as wastes. Conceivably, this objective may be realized by heating the sheared fuel matrix to 750C or less in air or oxygen to release the volatile fission products via thermal evalution or chemical reaction. The gases are then carried out of the voloxidizer unit for subsequent trapping and retention within the plant. At this time, the major emphasis is on the removal of tritium from U02 and U02-Pu02 fuels, since this fission product would otherwise be irretrievably diluted into the aqueous streams during dissolution of the fuel. (Houser-ORNL)
W74-13131

QUARTERLY PROGRESS REPORT - RESEARCH AND DEVELOPMENT ACTIVITIES, WASTE FIXATION PROGRAM, JANUARY THROUGH MARCH 1974.
Battelle-Pacific Northwest Lab., Richland, Wash. Nuclear Waste Technology Dept.
Available from NTIS, Springfield, Va, as BNWL-1826, $4.75/copy, $2.25/microfiche. Report No BNWL-1826, April 1974. J. L. McElroy, Compiler. 77 p, 16 fig, 14 tab.

Descriptors: *Research and development, *Management, *Nuclear wastes, *Waste disposal, *Waste treatment, Waste storage, Tritium, Water vapor, Hydrogen, Gases, Leaching, Research facilities, Solvent extractions.
Identifiers: *Waste fixation, Waste calcination.

Six runs were completed with the spray calciner and Inconel melter. In one run, where ruthenium volatilization was followed, about 2.4% of the feed ruthenium was observed in the calciner-melter condensate and none in the caustic scrubber solution or downstream gas samples. In the sixth run, DSS-15, a 510-hour run was completed in which 11,300 liters of PW-4b feed were calcined and 2.4 metric tons of borosilicate glass were produced. Data from this run are still being analyzed. Development of the ceramic electrode heated melter was continued. Studies continued on the inconel metallic melter for handling high level waste; progress is reported in the glass leach rate effort; research continues on waste calcination and product gases. A comprehensive safety and systems evaluation for the definition and investigation of nuclear waste management systems is well underway. (Houser-ORNL)
W74-13132

DETERMINATION OF TRITIUM IN WASTE PROCESSING EFFLUENTS BY DISTILLATION AND LIQUID SCINTILLATION EMULSION COUNTING,
Atlantic Richfield Hanford Co., Richland, Wash. Manufacturing and Waste Management Div.
For primary bibliographic entry see Field 5A.
W74-13134

TECHNICAL AND SOCIAL ASPECTS OF NUCLEAR WASTE DISPOSAL IN WESTERN EUROPE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nuclear Engineering.
D. J. Rose, and G. Tenaglia.
AMBIO, Vol 2, No 6, p 233-240, 1973. 3 fig, 11 ref.

Descriptors: *Radioactive waste disposal, Technology, *Methodology, *Social aspects, Strontium, Cesium, Plutonium, Americium, Uranium, Nuclear powerplants, Fuels, Hazards, Analysis, Effluents, Nuclear energy, Economics, Waste storage, Public health.
Identifiers: *Actinides, *Fuel reprocessing.

Useful new technical options for preparing and treating nuclear wastes seem available. But even so, the shortest time needed for safe storage of radioactive wastes such as fission products will be at least 700 years. The key issues of the problem are the moral responsibility of reducing risks to present and future generations, and the longevity of human institutions. The basic responsibility for the disposal of high level nuclear wastes should rest with the nations rather than with international organizations, as nations have a greater continuity in time. Two proposals offered for disposal, though impractical for the present but bear watching, are transport into the sun and nuclear transmutation of radioactive wastes. The best remaining options seem to be retrievable surface storage and permanent disposal by sealing in stable impervious geologic formations. (Houser-ORNL)
W74-13135

HYGIENIC EVALUATION OF POLYMERS USED IN THE MEMBRANE METHODS OF WATER DESALINATION (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Selskoi Gigieny, (USSR).
E. V. Shtannikov, G. I. Rozhnov, A. M. Akimov, V. B. Aksenova, and B. M. Khonin.
Gig Sanit. Vol 37, No 4, p 23-25. 1972. English summary.
Identifiers: Embryo, *Membranes, Polymers, *Toxicity, *Desalination, *Waste water treatment.

The heterogenic membrane MA-4 (an artificial membrane made of polethylene and anion exchanger) inparts a smell to water. The membrane MA-41 discharges unlimited substances into the water extract. The tested samples of acetylcellulose membrane had no pronounced effect on the properties of water. The investigated substances were weakly cytotoxic in rats. The acetylcellulose membrane was embryotoxic.--Copyright 1974, Biological Abstracts, Inc.
W74-13159

NITROGEN TRANSFORMATIONS AND AVAILABILITY OF AN ANAEROBICALLY DIGESTED SEWAGE SLUDGE IN SOIL,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-13163

SOLUBILIZATION OF HYDROCARBONS BY THE DISSOLVED ORGANIC MATTER IN SEA WATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. D. Boehm, and J. G. Quinn.
Geochim Cosmochim Acta. Vol 37, No 11, p 2459-2477. 1973. Illus.

Descriptors: *Pollutants, *Solubility, *Fulvic acids, Acids, *Organic compounds, Water pollution, Estuaries, Effluents, Wastes, Water pollution sources, *Sewage effluents, Chemical analysis, Fuels, Oil, Sea water, *Waste water treatment, Waste water disposal, Sediment transport, *Rhode Island.
Identifiers: Micelles.

Water samples from Narragansett Bay and the Providence River, and fulvic acid/saline water solutions were examined for their ability to solubilize n-alkane (n-C16 and n-C20), isoprenoid (pristane) and aromatic (phenanthrene and anthracene) hydrocarbons and dibutyl phthalate. Removal of the dissolved organic matter (DOM) from the natural samples by activated charcoal and by UV oxidation resulted in a 50-99% decrease in the amounts of n-alkanes and isoprenoid hydrocarbons solubilized. This decrease was directly related to the amount of DOM removed. The solubilities of the aromatic hydrocarbons were unaffected by the DOM. Fulvic acid from a marine sediment, surface active organic material isolated at a chloroform/sea water interface, organic material extracted from a marine sediment by sea water, and organic matter contributed by a municipal sewage effluent, promote n-alkane solubility when added to NaCl solutions and reenhance solubility when added to organic depleted sea water. The solubility of Number 2 fuel oil increased 2.5 times in the presence of fulvic acid (3.7 mg C/l) with most of the increase seen in the alkane and isoprenoid components. N-Alkane solubility increases in fulvic acid/saline water solutions with increasing pH and reaches a maximum with respect to ionic strength at I = 0.3. The mode of solubilization of the hydrocarbons may be by incorporation into micelles formed by intermolecular association of the surface active humic-type monomers. The presence of ionic species is a prerequisite for micelle formation. (These findings have implications for the fate of hydrophobic pollutants in estuarine and coastal areas and the effect of municipal sewage effluents on the transport of these pollutants).--Copyright 1974, Biological Abstracts, Inc.
W74-13166

HYDROLOGIC PERSPECTIVE OF SURFICIAL WASTE DISPOSAL,
Geological Survey, Tampa, Fla.
J. W. Stewart, A. D. Duerr, C. B. Hutchinson, J. J. Hickey, and D. P. Brown.
Field Trip Guide for Symposium held in Tampa, Florida, April 16-18, 1974. 36 p, 15 fig.

Descriptors: *Waste water disposal, *Waste disposal, *Landfills, *Sprinkler irrigation, *Florida, Municipal wastes, Sewage treatment, Waste water treatment, Conferences.
Identifiers: *Tampa(Fla).

A field trip was held in Tampa, Florida to study the effects of disposal of wastes on the surface. The Eureka Springs site in the eastern part of the county requires extensive dewatering in order to maintain landfilling operations. The development of the Toytown landfill has resulted in substantial stresses on the water-table aquifer system. Under natural conditions, the land is poorly drained, and the water table is near land surface. Quality of water within a 4-mile radius is monitored by means of 39 wells completed in the surficial aquifer, 41 wells completed in the Floridan aquifer and 14 surface-water stations at ponds and drainage canals. A 50-acre tract is used as an experimental sod farm to evaluate the feasibility of the spray method for sludge disposal. In another study, spray irrigation is being tested for disposal of the effluent from a secondary-treatment plant. Peninsular Pinellas County is faced with major problems in meeting pollution-control aims of zero dishcarge. In some areas of the county, land spreading is probably not a practical alternative for large volumes of effluent. The county's new system contains a waste-treatment plant, storage pond, an underdrained spray-irrigation area, a furrow-irrigation area, and two deep waste-water injection wells. At Innisbrook, a condominium-resort complex, spray-irrigation is presently part of the waste-treatment system. Spray irrigation of a pasture with waste-treatment plant effluent has also been in progress for about 5 years at the United Brotherhood of Carpenters and Joiners of America Home. The low rate of application has caused only minor apparent changes in water quality. (Knapp-USGS)
W74-13210

INTERIM EFFLUENT GUIDANCE FOR NPDES PERMITS,
Environmental Protection Agency, Washington, D.C. Permit Program Div.
For primary bibliographic entry see Field 5G.
W74-13214

THE EFFECT OF PHENOLS AND HETEROCYCLIC BASES ON NITRIFICATION IN ACTIVATED SLUDGES,
University Coll. of South Wales and Monmouthshire, Cardiff. Dept. of Microbiology.
D. A. Stafford.
Journal of Applied Bacteriology, Vol 37, No 1, p 75-82, 1974. 7 fig, 1 tab, 9 ref.

Descriptors: *Activated sludge, *Phenols, *Nitrification, *Suspended solids, Temperature, Ammonia, Oxidation, Mathematical models, *Waste water treatment, Water pollution effects.
Identifiers: Ammonia oxidation, Nitrite oxidation, *Heterocyclic bases.

The optimum conditions of pH, suspended solids concentration, temperature and age of sludge, for nitrification by activated sludge have been studied. Activated sludge receiving ammonium thiocyanate (500 mg/liter) was able to nitrify. The rate of ammonia oxidation was decreased when less than 3 mg/liter of phenol (or cresols) was added to the sludge, and at 10 mg/liter was inhibited completely. Concentrations of up to 100 mg/liter of phenols did not affect nitrite oxidation. The 2- and 4-methyl pyridine derivatives inhibited both ammonia and nitrite oxidation. (Prague-FIRL)
W74-13235

SANITARY-VIROLOGICAL CHARACTERIZATION OF SEWAGE WATERS FROM SOME URBAN SEWAGE SYSTEMS IN THE UZBEK SSR, (IN RUSSIAN),
Uzbeksksii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
For primary bibliographic entry see Field 5A.
W74-13241

OIL/WATER SEPARATION ACCELERATION MEDIA,
Oil Mop, Inc., New Orleans, (assignes).
For primary bibliographic entry see Field 5G.
W74-13243

FLUID SEPARATION APPARATUS AND MEMBRANE SUPPORT FRAMES THEREFOR,
G. Niogret.
United States Patent 3,809,246. Issued May 7, 1974. Official Gazette of the United States Patent Office, Vol 922, No 1, p 179, May, 1974. 1 fig.

Descriptors: *Separation techniques, *Patents, *Membranes, Liquids, Equipment, Waste disposal, Liquid wastes, *Waste water treatment.
Identifiers: *Fluid Separation.

A fluid separating apparatus has a support frame for placement between the membranes. The frame comprises a generally rectangular plate, with two faces and two ends. At least one cell forming a recess is formed in each face, and at least one orifice extends through the thickness of the plate adjacent to the ends of the plate for the passage of fluid to be treated. A duct exists for the removal of fluid which is passed through the membrane supported by the plate over each of the cells forming recesses. An aperture passes through the plate and is positioned between at least one of the orifices and the cell forming recess. The aperture has a detachable clamp to clamp membranes disposed on each of the faces in a fluid-tight manner against a rules surface of the rectangular plate. (Prague-FIRL)
W74-13244

FUEL SEDIMENT BOWL ASSEMBLY,
Deere and Co., Moline, Ill. (assignes)
J. E. Jackson.

Descriptors: *Patents, *Fuel, Pumping, Sediment, *Separation techniques, Equipment , Valves, *Waste water treatment.
Identifiers: *Fuel sediment bowl assembly, Fuel pumps, Valving.

A fuel sediment bowl assembly is described. The assembly is built between a source of fuel and a fuel pump. A hand pump cooperates with appropriate valvaing for pumping fuel into the sediment bowl when separated water in the bowl is being drained. The action of the pump effects the replacement of the volume formerly occupied by the water by fuel such that no air will be introduced into the system. The sediment bowl assembly also includes a baffle at the top. This aids in the separation of water from the fuel which is drawn through. (Prague-FIRL)
W74-13245

ROTARY COUNTERCURRENT SOLID-LIQUID EXTRACTION APPARATUS,
Raffinerie Tirlemontoise, Brussels (Belgium). (assignes)
G. F. Duchateau.
United States Patent 3,809,538. Issued May 7, 1974. Official Gazette of the United States Patent Office, Vol 922, No 1, p 255, May, 1974. 1 fig.

Descriptors: *Patents, Extraction, Liquids, Solids, Equipment, *Waste water treatment, Flow, *Solvent extractions.
Identifiers: *Rotary countercurrent apparatus, *Solid/liquid extraction, Liquid fraction, Solids fraction.

A method was designed for extracting, by means of a liquid, products which are part of solids in a partitioned rotating extractor. The flow of the liquid fraction, separated from the solids fraction, is slowed down by baffles and the liquid fraction is spread over the length and width relative to the new solids fraction. (Prague-FIRL)
W74-13247

DEVICE FOR REMOVING A SLUDGE FROM A SURFACE,
Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo (Japan). (assignee)
K. Shibata, Y. Seika, I. Sakamoto, K. Yamada, and S. Kondon.
United States Patent 3,808,631. Issued May 7, 1974. Official Gazette of the United States Patent Office, Vol 922, No 1, p 21, May, 1974. 1 fig.

Descriptors: *Patents, *Sludge treatment, *Jets, Liquids, Slurries, *Waste water treatment, Conduits, Liquid wastes.
Identifiers: *Sludge removal, Shovel.

A device for removing a sludge from the surface of a liquid or from a floor such as a deck of a tanker is described. This includes a shovel which is adapted to be moved along the sludge with its opened mouth positioned to receive the sludge. The construction includes a connection for directing a high velocity liquid jet into the shovel in the vicinity of the mouth to impinge upon the sludge and to break it up into a slurry. In addition, means are provided for withdrawing the slurry upward through a conduit for discharge at a remote location. The discharging connection consists of a liquid ejector which is operated partly be the conduit connected for supplying the high velocity jet of liquid to the shovel. This is connected to the shovel for providing a withdrawing suction or pumping action on the slurry which forms in the shovel. In a further embodiment, the interior of the shovel is provided with a screen or grate across the shovel interior onto which the slurry is directed and against which the high velocity liquid jet is directed. The action breaks up the slurry elements into finer elements for withdrawal through the discharge conduit. A still further embodiment includes an intermediate chamber at the rear of the shovel and a plurality of turning water streams. These are directed in a whirling flow to cause a rotation and further pulverizing of the slurry material before it is delivered through the discharge conduit. (Prague-FIRL)
W74-13249

PURIFICATION PROCESS,
North Western Gas Board, Rochdale (England). (assignee)
T. Nicklin.
United States Patent 3,810,833. Issued May 14, 1974. Official Gazette of the United States Patent Office, Vol 922, No 2, p 593, May, 1974.

Descriptors: *Patents, Effluents, *Salts, Liquids, Hydrocarbons, Gases, Ion exchange, Removal, *Water purification, *Waste water treatment.
Identifiers: *Fuel gasses, *Vanadium compounds, Sodium anthraquinone disulphonates, Effluent liquors, Adsorbent beds.

An effluent purification process was patented for removing vanadium salts, sodium anthraquinone disulphonates and di-hydroxyanthraquinones from effluent liquors which have been used in processes for removing hydrogen sulphide from fuel gases or liquid hydrocarbons. The process comprises passing the liquor through an adsorbent bed to remove the anthraquinone compounds and through an ion exchange material to remove the vanadium compounds. (Prague-FIRL)
W74-13250

FLOATING APPARATUS FOR LIQUID COMPOSTING,
Fairfield Engineering and Mfg. Co., Iowa. (assignee).
R. S. Blough.
United States Patent 3,810,548. Issued May 14, 1974. Official Gazette of the United States Patent Office, Vol 922, No 2, p 523-524, May, 1974. 1 fig.

Descriptors: *Patents, *Animal wastes, Liquid wastes, *Equipment, *Aeration, Flotation, *Waste water treatment, Circulation, Reservoirs.
Identifiers: *Liquid composting equipment, Floating apparatus.

A floating apparatus for aerating and circulating animal waste material was designed for use preferably in a relatively deep reservoir. This liquid composting equipment is comprised of an outer float assembly for floating support of the apparatus on the surface of the material in the reservoir; a rotatable hollow shaft extending down into the material, the lower end being adapted to permit air to exit; an axial thrust propeller rigidly attached to the lower end of the shaft; and a drive means for rotating the shaft and propeller to draw air down out of the lower end of the shaft to generate small bubbles, which are propelled into the material. The apparatus also has a barrier including a hollow cylinder concentrically surrounding the drive means and shutting off the supply of air at the upper end of the hollow shaft. (Prague-FIRL)
W74-13253

DREDGE AND SLUDGE ALEMBIC,
G. S. Kiss.
United States Patent 3,810,549. Issued May 14, 1974. Official Gazette of the United States Patent Office, Vol 922, No 2, p 524, May, 1974. 1 fig.

Descriptors: *Patents, *Dredging, Tanks, Settling, Screens, Slurries, *Waste water treatment, *Sludge treatment.
Identifiers: *Sludge alembic.

A sludge alembic is comprised of a sludge receiving tank with vibratory means in its interior for settling out the sludge solids or residue, and a screen means through which discharged water must flow. This alembic, which may be stationary, portable, or mounted on a barge or dredge, permits the location of a conveyor means beneath it for transporting slurry. The unit is called a combination dredge and sludge alembic. (Prague-FIRL)
W74-13254

TREATMENT OF WATER OR AQUEOUS SYSTEMS,
Ciba-Geigy Corp., Ardsley, N.Y. (assignee)
T. I. Jones, N. Richardson, and A. Harris.
United States Patent 3,810,834. Issued May 14, 1974. Official Gazette of the United States Patent Office, Vol 922, No 2, p 593, May, 1974.

Descriptors: *Patents, *Water treatment, *Metals, *Salts, *Waste water treatment.
Identifiers: Insoluble salts, Dissolved metal salts, *Hydrolysed polymaleic anhydride, Aqueous systems.

Hydrolyzed polymaleic anhydride is used for the treatment of water or aqueous systems containing dissolved salts of metals. This serves two functions: to cut down the rate at which insoluble salts are formed; and to modify their nature. (Prague-FIRL)
W74-13256

ENVIRONMENTAL CONTROL EQUIPMENT.
Hitachi Review, Vol 23, No 4, p 188-191, 1974.

Descriptors: *Equipment, *Environmental control, *Pollution abatement, *Waste water treatment, Tertiary treatment, Treatment facilities, Air pollution, Waste treatment.

Major technical achievements in 1973 in the field of atmospheric pollution control include an electric precipitator for utility boilers burning heavy fuel oil and crude oil, a large-capacity electric precipitator for industrial plants, and various dust collectors. Hitachi's contributions to water pollution prevention include a total system for waste water treatment, supplied to a power station, where it is in satisfactory operation. For general industrial waste water, facilities were developed for advanced treatment of machine works waste water by the activated carbon process and for electrolytic treatment of high-polymer effluents. In the field of industrial waste treatment, improvements included a sludge incinerator combining a centrifugal membrane evaporator and a dewatering device. In addition, Hitachi developed a new sludge incineration system in which coal power is mixed in undigested sludge, which is directly burned in a fluidized bed of an activated catalyst. Another invention is the sludge dryer by an infrared ray heater. Features of this equipment are detailed. (Sandoski-FIRL)
W74-13263

IRON: A TWO-EDGED SWORD.
Water and Pollution Control, Vol 112, No 5, p 26-27, May, 1974.

Descriptors: *Iron, *Water quality control, *Industries, *Waste water treatment, Chlorine, Ozone.
Identifiers: *Treatment methods.

Iron in water has an unpleasant connotation for municipal, industrial and domestic situations, with the chief concern of municipalities being the limitation of iron concentration below required guidelines. However, industry quality control personnel have the greatest incentive in keeping iron problems to a minimum, due to unsaleable commodities if an excess of ferric ions are present. Various chemicals and treatment methods used in removing iron and maintaining water qualoty control are outlined. (Sandoski-FIRL)
W74-13267

EFFECTS OF GAMMA RADIATION ON AQUEOUS SOLUTIONS OF PHENOLS,
Florida Inst. of Tech., Melbourne. Univ. Center for Pollution Research.
L. M. Coffman, and D. D. Woodbridge.
Bulletin of Environmental Contamination and Toxicology, Vol 11, No 5, p 461-466, May, 1974. 1 fig, 13 ref.

Descriptors: *Irradiation, *Waste water treatment, *Phenols, Gamma rays, Laboratory tests, Feasibility studies.

The beneficial use of radiation has been investigated for many applications. Radiation research and development applied to waste water treatment has been limited; however, sufficient research has been done to indicate that the use of radiation may be beneficial in the treatment of urban and industrial waste water. The irradiation process is explained and the experimental procedure involving irradiation of aqueous solutions of phenols outlined. Results show that the phenol structuer can be destroyed by gamma radiation. At phenol concentrations of 10 mg/liter, almost complete destruction occurred at a dose rate of one million rads. Furthermore, this work indicates that the destruction of phenols by gamma radiation from Cobalt-60 is feasible. (Sandoski-FIRL)
W74-13274

ATMOSPHERIC COOLERS FOR COOLING INDUSTRIAL WATERS,
M. Vitek.
Czechoslovak Heavy Industry, No 4, p 39-44, 1974. 7 fig, 1 tab.

Descriptors: *Industrial water, *Water cooling, *Cooling towers, Equipment, Municipal water, Fresh water, Waste water treatment, Treatment facilities.
Identifiers: *Microtowers.

Microtowers, atmospheric coolers of the M range, are coolers of industrial water with fans, manufactured mostly of plastics. These are easy to assemble, and alleviate the shortage of fresh water for towns as well as for industries. Microtowers are manufactured in four sizes which are chosen so that all requirements for cooling circuits of smaller capacities can be met. The cooling of the larger quantity of water can be arranged by the connection in parallel of several microtowers in a cooling circuit. One advantage of a parallel connection of several cooling towers is easy maintenance. Also, the probability of cutting some unit out of service increases as the weather gets cooler. Microtowers are of a simple design, their erection and attendance are easy, and their operation is economical within a wide range of operating conditions. (Sandoski-FIRL)
W74-13275

REVERSE OSMOSIS CUTS SOLIDS,
Gibbs and Hill Inc., New York.
V. T. Burns, Jr.
Water and Wastes Engineering, Vol 11, No 5, p C-6-C-12, May, 1974. 2 fig, 3 tab.

Descriptors: *Reverse osmosis, *Waste watr treatment, Industrial water, *Dissolved solids, Treatment facilities, Water supply, Coal, Equipment, *West Virginia.

A new reverse osmosis unit with a capacity of 250 gpm is reducing total dissolved solids while providing water to the Harrison Power Station near Haywood, West Virginia. The station consists of three 600 MW units with steam design conditions at 3675 psig with reheat to 1000 F. The primary fuel is pulverized coal which is normally delivered by overland conveyor from a nearby mine. Water supply for make-up to recirvulating cooling systems is from the West Fork River. Two natural draft towers serve the three units. Water for make-up to the thermal cycle, potable use, fire head tank, and filtered water for miscellaneous service is designed for supply from an existing reservoir. Emergency backup comes from the West Fork River. This emergency backup supply of 650 gpm is taken from the 36-inch pipelines providing make-up supply to cooling systems. (Sandoski-FIRL)
W74-13280

EMULSIFIED OILY WATER TREATING EQUIPMENT.
Technical Review, Vol 11, No 1, p 79-82, February, 1974. 6 fig, 3 tab.

Descriptors: *Oily water, *Waste water treatment, *Treatment facilities, Equipment.

Mitsubishi Heavy Industries has recently developed systems for treatment of waste water contaminated with soluble cutting oil. These systems have been effectively utilized on practical scales, and are illustrated. An outline of the systems for treating such waste water is provided. (Sandoski-FIRL)
W74-13281

PACKAGE TYPE WASTE WATER TREATING APPARATUS.
Technical Review, Vol 11, No 1, p 83-84, February, 1974. 3 fig, 1 tab.

Descriptors: *Equipment, *Oily water, *Waste water treatment, Flotation, Treatment facilities, Performance.

A package type apparatus can be widely used for effective treatment of waste water by the chemical flotation method including the treatment of oily water, that of waste water arising from the marine products processing industry, and that of non-precipitating waste water containing suspended solids. For treating oily water, a coalescer is used for the primary treatment behind which this apparatus is installed to be used for the secondary treatment to guarantee that the final oil content in the waste water treated is below 1 ppm. For other waste water treatment, the coalescer is not required. Examples of the performance of this waste water treatment apparatus against various kinds of waste water are tabulated. (Sandoski-FIRL)
W74-13282

WATER-TREATMENT-PLANT WASTES DISPOSAL-PART I,
Malcolm Pirnie, Inc., Paramus, N.J.
For primary bibliographic entry see Field 5F.
W74-13284

RECOVER ALUM TO REDUCE WASTE-DISPOSAL COSTS,
Metcalf and Eddy, Inc., New York.
G. P. Fulton.
Journal of the American Water Works Association, Vol 66, No 5, p 312-318, May, 1974. 4 fig, 2 tab, 1 ref.

Descriptors: *Aluminum, *Waste water treatment, *Sludge treatment, Dewatering, *Recycling, Waste disposal, Methodology, *Costs, Treatment facilities, Equipment.

Alum is widely used in water treatment, but current investigations of other coagulants to be used were held, due to the difficulty in disposing of alum sludge. A relatively easy, inexpensive method that makes possible pre-treatment of alum sludge so that it can be dewatered and reused is described. This convertible alum-recovery process offers several advantages. The aluminum hydroxide-raw-water suspended-matter wastes are relatively easy to separate from the discharge carrier flow. This leaves a supernatant of good quality for recycling through the water plant. Since an alternative method of waste disposal is mandatory for any type of waste recycle, alum recovery is the most economical to install and to operate. The reduced need for new or make-up alum decreases both delivery handling and delivery-truck traffic. In addition, the use of alum as a coagulant without affecting well-established water treatment methods is retained. (Sandoski-FIRL)
W74-13285

VARENESS WATER PLANT PLANNED FOR EXPANSION.
Water and Pollution Control, Vol 112, No 5, p 16-17, May, 1974.

Descriptors: *Water supply, *Treatment facilities, *Canada, Design criteria, Flocculation, Sedimentation, Filtration, Construction costs, Instrumentation, Equipment, Sand, Lime, Hydrogen ion concentration, St. Lawrence River, *Waste water treatment.
Identifiers: Anthracite filtration.

The city of Varennes, located on the south shore of the St. Lawrence River opposite Montreal, Canada, has recently completed a major expansion of its water supply facilities. Designed with an initial capacity of 2.0 mgd with provision for expansion to 6.0 mgd, the facility provides for flocculation, sedimentation, plus rapid sand and anthracite filtration. Built at a cost of $1.25 million, the new plant also incorporates a laboratory equipped with sample taps to analyze raw, mixed, flocculated, pre- and post-filtered, and finished water. Instrumentation and equipment includes a Zeta potential meter, filterability plague, void pump, and turbidimeters. Polyelectrolite can be added to assist filtration. Chlorine dioxide is used to help remove occasional taste and odor. Lime can be incorporated to correct pH, and fluor is also available. (Sandoski-FIRL)
W74-13286

TREATMENT OF OILY WASTE WATER USING ACTIVATED CARBON,
T. Matsumoto, M. Inoue, T. Takeuchi, and E. Sugimoto.
Mitsui Zosen Giho (Mitsui Shipbuilding Technical Review), Vol 85, p 1-10, January, 1974. 14 fig, 1 tab, 6 ref.

Descriptors: *Waste water treatment, *Oily water, *Activated carbon, Adsorption, Mathematical studies.

Experiments were carried out on the treatment of oily waste water using activated carbon with about 10 ppm oil at the inlet and less than 1 ppm at the outlet of the fluidized bed adsorption column. Results are presented in mathematical formulas. (Sandoski-FIRL)
W74-13287

STUDY ON MECHANICAL SURFACE AERATOR,
I. Shiramasa.
Mitsui Zosen Giho (Mitsui Shipbuilding Technical Review), Vol 85, p 61-66, January, 1974. 9 fig.

Descriptors: *Aeration, Equipment, *Activated sludge, Design criteria, Oxygen requirements, Efficiencies, *Waste water treatment.
Identifiers: *Mechanical aerators, Oxygen transfer.

Mechanical aerators have become widely used in the activated sludge process due to their simplicity of design and construction and superiority in oxygen transfer capacity per unit horsepower. Hydraulic and oxygen-transfer tests were conducted with the following results being obtained. Oxygen transfer efficiency is directly proportional to the horesepower, and oxygen transfer capacity is approximately equivalent to 2.5 kg 02/kWH. The shape of the blade is very important in controlling oxygen transfer capacity by change in the depth of its submergence. Aerator speed must be between 3 and 6 m/sec at the extremity of the blade. A baffle must be provided for the aeration tank to prevent surging. A change in the number of blades plus a change in the depth of submergence results in a change in the oxygen transfer coefficient. (Sandoski-FIRL)
W74-13288

ADVANCED SEWAGE TREATMENT PILOT PLANT FOR DAVYHULME,
M. Sane.
Water and Waste Treatment, Vol 17, No 5, p 18-20, May, 1974. 1 fig, 2 tab, 1 ref.

Descriptors: *Pilot plants, Equipment, *Treatment facilities, Construction materials, Investigations, *Sewage treatment, Flow rates, Instrumentation, Monitoring, Sludge treatment, Waste water treatment.
Identifiers: *United Kingdom(Davyhulme-Eng).

The aims of the Davyhulme, England, pilot plant; the equipment to be installed; and the various treatment processes available for investigation using the equipment provided are outlined. The pilot plant, designed primarily for manual control, should abstract up to 96,000 gpd of raw screened and macerated sewage from below the intake works, abstracting at either fixed rates of flow from 500 to 4000 gph or in accordance with a

prearranged program representing a diurnal variation of flow. All process vessels incorporated in the plant will be fabricated in steel, suitably protected, to facilitate dismantling and re-erection on alternative sites. (Sandoski-FIRL)
W74-13290

THE EUROPEAN SCENE,
Emschergenossenschaft and Lippeverband, Essen (West Germany). Dept. of Chemistry.
F. Malz.
Water Pollution Control, Vol 73, No 3, p 289-294, 1974. 2 tab.

Descriptors: *Europe, *Sewage treatment, *Treatment facilities, Industrial wastes, Monitoring, Water quality control, Organizations, Waste water treatment.
Identifiers: *Switzerland, *Holland, *Sweden, *West Germany.

A description of sewage treatment facilities in Switzerland, Holland, Sweden, and Western Germany is presented. The trend of improvement of their technical activities in the control of water pollution is examined. Various water associations are mentioned as well as treatment practices for industrial wastes and water quality monitoring. (Sandoski-FIRL)
W74-13293

THE SEALING MECHANISM OF WASTE-WATER PONDS,
California Univ., Riverside. Dept. of Soil Science and Agriculture.
A. C. Chang, W. R. Olmstead, J. B. Johanson, and G. Yamashita.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1715-1721, July, 1974. 5 fig, 5 tab, 11 ref.

Descriptors: *Soil water movement, *Hydraulic conductivity, *Soil types, Waste storage, Ponds, Soil chemistry, Cations, Anions, Suspended solids, Microbial degradation, Waste water treatment.

The change of hydraulic conductivity in soils under prolonged submergence of waste water has been determined together with the chemical change of soils at the bottom of waste water ponds and the mechanism that reduces the rate of infiltration in these ponds. Columns of four different soil types recovered from the bottom of the pond indicate a quick reduction of soil hydraulic conductivity and a sharp increase of leachable cations and anions in all soils studied. The layer that restricted the movement of water initially occurred at the surface, two inches into the soil column. The initial sealing was caused by the physical entrapment of suspended particles in soil followed by a secondary mechanism of microbial growth that completely sealed off the soil from water movement. The drying of these completely sealed off columns returned the hydraulic conductivity of columns back to the initial magnitude thus indicating that the inhibition of water movement in soils was not caused by the change of cations that cause the deflocculation of soil particles. (Sandoski-FIRL)
W74-13299

ELECTROCHEMICAL TREATMENT OF INDUSTRIAL WASTE WATER,
Mitsubishi Heavy-Industries Ltd., Tokyo (Japan).
Y. Kuji, T. Kato, and M. Maeda.
Mitsubishi Denki Giho, Vol 48, No 4, p 418-423, April, 1974. 16 fig, 6 tab, 4 ref.

Descriptors: Equipment, *Electrodes, Electrochemistry, Application techniques, *Industrial wastes, *Waste water treatment, Flocculation.
Identifiers: *Electrochemical flocculation, *Japan.

In the past a drawback to the electrochemical treatment of industrial waste water has been the accumulation of scale on the surface of the electrode which prevents current from flowing, thus stopping the function device. Mitsubishi Industries has developed an epochal electrochemical treatment device with minute gap high speed flow to eliminate this problem. The features of the unit and examples of its application are presented. Basic theory of electrochemical flocculation is also explained. (Sandoski-FIRL)
W74-13303

CHEMICAL TREATMENT OF LEACHATES FROM SANITARY LANDFILLS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
S. Ho, W. C. Boyle, and R. K. Ham.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1776-1791, July, 1974. 4 fig, 12 tab, 5 ref.

Descriptors: *Leachate, Evaluation, Chemical reactions, Water quality, Laboratory tests, Chemicals, *Landfills, *Waste water treatment.
Identifiers: Treatment methods, *Chemical treatment.

The treatability of leachate by physical-chemical methods has been studied. The objective of the study was to evaluate the ability of various chemicals to remove key contaminants from leachate; the approach was to determine the potential usefulness of each class of chemicals that conceivably could be used to treat leachate. The results of this study should not be considered adequate for design purposes. Because of variations in leachate composition, treated water quality objectives, and site limitations, it is expected that more detailed laboratory testing should be conducted prior to final design for any given installation. Results of this study can be used in determining which of the various treatment schemes available should be examined further. (Sandoski-FIRL)
W74-13305

WASTE WATER TREATMENTS INCLUDING OZONATION PROCESS,
S. Suzuki, Y. Mizukami, Y. Kuji, M. Morikawa, and H. Matsuoka.
Mitsubishi Denki Giho, Vol 48, No 4, p 405-417, April 1974. 37 fig, 14 tab, 13 ref.

Descriptors: *Ozone, *Waste water treatment, Water purification, Tertiary treatment, Water reuse, *Industrial wastes.
Identifiers: *Ozonation, *Japan.

The characteristics of ozonation are described and various practical treatment systems are presented for the Mitsubishi industries. Cases and experimental results of ozonation of phenol and cyanide containing water for sterilization are reported. Finally, results at a tertiary treatment test plant for reuse of sewage water are disclosed. (Sandoski-FIRL)
W74-13306

WASTE TREATMENT PLANT MINIMIZES EFFLUENT.
Modern Power and Engineering, Vol 68, No 4, p 50-51, 83-84, April, 1974.

Descriptors: *Treatment facilities, *Waste water treatment, Industrial wastes, Waste treatment, Performance, Chemical wastes, Design criteria, Effluents, *Canada.

A waste treatment plant at Air Canada's new 500,000 square foot maintenance base provides efficient waste treatment to a wide variety of liquid effluents from cleaning, stripping, electroplating, surface metal finishing, heat treatment, and machining of aero engine parts. The system handles 500,000 pounds of alkalies, 12,000 pounds of cyanides, 4500 pounds of potassium permanganate, and 4000 pounds of hexavalent chrome each year. Toxic chemical wastes from the maintenance processes are destroyed, neutralized, or extracted before the plant's liquid wastes are discharged into the sewage system. Design features and performance of the system are detailed. (Sandoski-FIRL)
W74-13307

EFFLUENT TREATMENT AT PLESSEY CO LTD.
Metal Finishing Journal, Vol 20, No 233, p 147-150, June, 1974.

Descriptors: *Treatment facilities, *Industrial wastes, Effluents, Automatic control, Water reuse, *Waste water treatment, Polyelectrolytes, Equipment, Metals.
Identifiers: *United Kingdom(Ilford-Eng).

As part of an extensive expansion and modernization program, a new electroplating and metal finishing department was recently put into service at The Plessey Company's headquarters in Ilford, England. A very wide range of processes are utilized, including nickel, cadmium, tin, silver, and gold plating, in addition to the usual vapor and aqueous degreasing, derusting, and chromate passivation processes. Fume extraction is provided for all process tanks, and a temperature controlled ventilation system delivers filtered air at a controlled rate to the entire plating shop. This ensures exceptional cleanliness and pleasant working conditions. (Sandoski-FIRL)
W74-13308

PHOSPHATE REMOVAL FROM DUCK FARM WASTES,
Cornell Univ, Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
R. C. Loehr, and K. J. Johanson.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1692-1714, July, 1974. 10 fig, 7 tab, 6 ref.

Descriptors: Investigations, *Phosphates, Industrial wastes, *Waste water treatment, *Farm wastes, Chemicals, Operating costs, Evaluation.
Identifiers: Phosphate removal, Sludge production.

Studies of phosphate removal from industrial waste water resulting from the production of ducks for slaughter are detailed. These studies were conducted over a period of two years, initially in the laboratory and subsequently in two full-scale field systems. The most effective chemicals, predictive relationships for chemical dosage, operating costs, and sludge production levels were evaluated. (Sandoski-FIRL)
W74-13309

BIOLOGICAL TREATMENT OF WASTE-WATER USING ALGAE AND ARTEMIA,
Texas Univ., Galveston. Medical Branch.
M. McShan, N. M. Trieff, and D. Grajcer.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1742-1750, July, 1974. 4 fig, 6 tab, 21 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Algae, *Brinp, Methodology, Operating costs, Biomass, *Waste water treatment.
Identifiers: *Artemia.

A new system for controlled eutrophication for either waste water or high organic wastes, such as shrimp ponds, has been researched. This system utilizes algae and brine shrimp as its main components. In such a system the algae fix the organic and mineral components bu using a light source; the brine shrimp graze on the algae, thus keeping the algae at a constantly high productivity level. The choice of brine shrimp is based on their ability

to withstand wide fluctuations in salinity and pH and to remain there. The system is adaptable to coastal and inland communities and the produced brine shrimp could offset some of the costs of the system. (Sandoski-FIRL)
W74-13311

DEGRADATION OF ORGANIC NITROGENOUS COMPOUNDS BY PSYCHROPHILIC BACTERIA,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
D. Prasad, and P. H. Jones.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1686-1691, July 1974. 4 fig, 25 ref.

Descriptors: *Laboratory tests, *Model studies, *Aerobic bacteria, Activated sludge, Nitrogen compounds, Microbial degradation, Organic compounds, Biological treatment, Microorganisms, Temperature, Waste water treatment.
Identifiers: *Waste stabilization, *Psychrophilic activity, *Psychrophiles.

The proteolytic activity and other physiological activity of a mixed bacterial population adapted to a peptone feed in a laboratory model of the activated sludge process operating at 2C has been studied. The environment was selective for psychrophiles. The physiological activity of organisms inhabiting this sludge was considered to be a measure of psychrophilic activity. Results indicate that in spite of the apparent metabolic stability of proteins at low temperatures, the psychrophilic bacteria may use other nitrogenous compounds such as urea, amino acids, and creatinine as a nitce. The comparative degradation rates of various organic compounds by psychrophilic bacteria at 20 and 2C indicate that these microorganisms play an important role in the stabilization of organic matter in the biological waste treatment processes. However, their activity at 2C is lower indicating that biological waste treatment processes can operate at low temperatures provided sufficient time is allowed for these organisms to degrade the organic wastes. (Sandoski-FIRL)
W74-13312

POLLUTION OF A STORAGE RESERVOIR BY ROOSTING GULLS,
Public Health Lab. Service, Leeds (England).
H. Fennell, D. B. James, and J. Morris.
Water Treatment and Examination, Vol 23, No 1, p 5-24, 1974. 4 fig, 2 tab, 25 ref.

Descriptors: *Reservoirs, *Salmonellae, *Gulls, Domestic wastes, Pollution, Water quality control, Bacteria, Surveys, Water pollution effects, *Waste water treatment.
Identifiers: Treatment methods.

A survey to evaluate pollution caused by roosting gulls was made over a thirteen month period on a storage reservoir. From the 111 samples taken from the reservoir, salmonellae were isolated from 52, although the specimens never originated from the incoming water from the catchment area. Treatment of the reservoir water effectively eliminated the pollution, never isolating the organisms from treated water or distribution. Roosting gulls are at their maximum in population in December and their minimum between April and July. During the winter a noticeable deterioration occurred in the bacteriological quality of reservoir water. It is suggested that domestic wastes from dumps provides sources of salmonallae, and that by feeding on such refuse, the gulls contaminate the reservoir. (Leibowitz-FIRL0
W74-13316

VELOCITY CONTROL WITH NEW PROPORTIONAL WEIRS,
Madras Univ., Guindy (India). Dept. of Hydraulics and Water Resources.
D. Chandrasekaran, and N. S. L. Rao.
Journal of the Institution of Engineers (India), Vol 54, Part PH2, p 48-54, February, 1974. 5 fig, 2 tab, 6 ref.

Descriptors: *Weirs, *Sediment, *Sewage treatment, *Water purification, *Settling tank, Flow velocity, *Waste water treatment.
Identifiers: Proportional weirs.

The design of an outlet weir is detailed and its potentiality to control the mean velocity of flow is described. Velocity varies inversely with the depth of flow. The settling phenomenon of sediment particles is important in sewage treatment plants, water purification works, and chemical mixing plants. Of many varied factors that affect settling, only the mean velocity of flow in a settling tank can be easily controlled by the designer. The control of mean velocity can be readily achieved by fixing suitably designed weirs at the outlets of the settling tanks or chambers. (Prague-FIRL)
W74-13323

THE WORK AND FACILITIES OF THE BRIXHAM LABORAORY OF IMPERIAL CHEMICAL INDUSTRIES LIMITED,
Water Pollution Control, Vol 73, No 3, p 336-340, 1974. 4 fig.

Descriptors: *Laboratory tests, *Industrial wastes, Effluents, *Analytical techniques, *Biological treatment, Surveys, Sampling, Investigations, *Waste water treatment.
Identifiers: *United Kingdom, Chemical treatment.

The Brixham Laboratory of the Imperial Chemical Industries has facilities and services available both to ICI and for outside industry. These enable work to be done on any operation normally encountured in effluent and pollution control. Analytical services use modern instrumental methods such as radioactive tracer techniques, gas-liquid chromatographs, and a special technique for analysis of total carbon. Areas of treatment include chemical and physical treatment, pilot investigations of biological treatment and ancillary processes, tertiary treatment, and work site surveys. Disposal research includes field surveys, biological surveys of fauna and flora samples, bacteriological surveys, and bioassays. (Prague-FIRL)
W74-13324

LOOE SEWERAGE AND SEWAGE-TREATMENT SCHEME,
Mouchel (L. G.) and Partners, Bath, (England).
C. Martin.
Water Pollution Control, Vol 73, No 3, p 331-335, 1974. 1 fig.

Descriptors: *Sewerage, *Combined sewers, *Sewage treatment, Storm runoff, Pollution abatement, Sewage districts, Planning, Costs, *Waste water treatment.
Identifiers: Treatment methods, *United Kingdom.

Since 1955, sewerage facilities in Looe have been planned. Treatment and disposal has been a problem, enlarged by different populations in summer and winter. Storm sewerage overflows have also been necessary to complement the combined sewer systems. The Cornwall County Council has agreed to make a substantial contribution to the cost. Looe is a holiday resort and discharge of sewage into its harbor cannot continue. Design and location of the works in an enclosed valley and removal of sewage pollution are detailed. (Prague-FIRL)
W74-13327

BERRY SEED SHELL AS FILTER MEDIA,
Visvesvaraya Regional Coll. of Engineering, Nagpur (India).
A. G. Bhole, and J. T. Nashikkar.
Journal of the Institution of Engineers (India), Vol 54, Part PH2, p 45-47, February, 1974. 5 ref.

Descriptors: *Sand filtration, *Flow, Filtration, *Filters, Dual media filters, Anthracite, Backwashing, Design criteria, *Waste water treatment.
Identifiers: *Berry seed shell.

It was found experimentally that berry seed shell satisfies the criteria required for a dual media filter. Conventional sand filtration involves the flow of materials from fine to coarse media. Its drawbacks include filter clogging and shorter filter runs. Ideally the flow should be from coarse to fine, giving longer filter runs. Upflow can not be universally used.r backwashing of an ideal filter, coarse media must remain at the top, even after fluidization. This is achieved by density differences between the two materials. Denser materials like sand can be of fine size which settles at the bottom. For the top layer, many lighter materials have been tried. Anthracite is most commonly used as coarse and light medium, but wat replaced by coal because of its higher cost. A locally available berry seed is described which resembles anthracite in almost all characteristics. (Prague-FIRL)
W74-13328

WATER TREATMENT PLANT (1140 CU M/HR) FOR SUNABEDA,
Orissa Public Health Dept., Bhubaneswar (India).
B. Mishra, S. N. Joshi, and K. N. Savalappan.
Journal of the Institution of Engineers (India), Vol 54, Part PH2, p 61-65, February, 1974. 6 fig.

Descriptors: *Waste water treat.emt, *Water quality control, Clarification, Flocculation, Water quantity, Industrial water, Design criteria, Turbidity, Treatment facilities.
Identifiers: *India(Sunabeda).

The location of an industry is often governed by the availability of an adequate quantity of water. The various unit operations involved in the 1140 cu m/hr water treatment plant at Sunabeda (Orissa) are discussed. Details of units and the design parameters of units are also given. Mertis and demerits of separate flocculation and clarification versus combination of both unit operations in one unit are shown. Construction and operation of an unconventional rapid sand gravity filter underrainage system is described. One-year performance of the plant is graphically shown with emphasis on clarified water turbidity and filtered water clarity. (Prague-FIRL)
W74-13329

SLUDGE DEWATERING WITH THE AID OF CONTINUOUSLY OPERATING PRESS-TYPE FILTERS (SCHLAMMENTWASSERUNG MIT KONTINUERLICHEN PRESSFILTERN),
I. J. Reuter, and H. Beckrath.
Aufbereings-Technik, Vol 15, No 5, p 253-259, May, 1974. 10 fig, 3 tab, 14 ref.

Descriptors: *Filters, *Municipal wastes, *Industrial wastes, *Costs, Equipment, Sludge treatment, Dewatering, Waste water treatment.

For the past eight years the filter belt press has been applied as a continuously operating press-type filter for dewatering municipal and industrial sludges. Recently, additional continuous press-type filters have been developed and tested. These include the tower press, the angle-type press, and the drum-type filter press. The machines differ primarily with regard to the operating direction of the filtering belts and the pressure to which the sludge is exposed while being dewatered. The paper quotes practical results. However, the figures available do not allow a direct, reliable comparison of the results and cost of sludge dewatering by using the four machines is compared. (Prague-FIRL)
W74-13330

THIS WATER FILTER CLEANS ITSELF,
Whitman and Howard, Inc., Boston, Mass.
S. Medlar.
The American City, Vol 89, No 6, p 63-65, June, 1974. 1 tab.

Descriptors: *Filtration, Water treatment, Contamination, Bacteria, Turbidity, Iron, Reservoirs, Filtration, Waste water treatment, Treatment facilities.

Burlington, Massachusetts uses a new water treatment technique. Using an automatic backwash carbon filter, the town's 6.0-mgd filtration plant treats water from its new 500-million gal reservoir for color, iron, taste, odor, turbidity, bacteria, corrosiveness and contamination. The plant's two filters are a silica sand with an effective size 0.60 mm, and an 8 x 30 mesh granular activated carbon. (Leibowitz-FIRL)
W74-13332

PROCESS FOR TREATING WASTES CONTAINING CHROMATES AND /OR COMPLEX IRON CYANIDES,
Amchem Products, Inc., Ambler, Pa. (assignee).
T. D. Henley, and R. F. Reeves.
United States Patent 3,819,051. Issued June 25, 1974. Official Gazette of the United States Patent Office, Vol 923, No 4, p 1377, June 25, 1974.

Descriptors: *Waste water treatment, *Patents, *Liquid wastes, Effluents, Anions, Precipitates.
Identifiers: *Chromates, *Iron cyanides.

Dissolved hexavalent chromium and dissolved complex iron cyanide (Fe(CN)6) are removed from a liquid waste effluent by adding a reducing agent with an anion capable of reducing the hexavalent chromium to trivalent chromium and a cation which forms a solid or precipitate with the complex iron cyanide. The preferred reducing agent is zinc hydrosulfite (ZnS2O4). (Prague-FIRL)
W74-13333

FLUID FILTER,
Donaldson Company, Inc., Minneapolis, Minn. (assignee).
R. L. Firth.
United States Patent 3,819,052. Issued June 25, 1974. Official Gazette of the United States Patent Office, Vol 923, No 4, p 1377, June 25, 1974. 1 fig.

Descriptors: *Filters, *Patents, Equipment, Flow, Liquids, Waste water treatment.
Identifiers: *Fluid filters.

A fluid filter was patented where a first cylindrical filter housing has an open top and is at least partially surrounded by a second housing. This forms a passageway. A baffle with a central opening is mounted in the open top and a cylindrical filter element is biased against the baffle member in the first housing. A dome-shaped cover is attached on top of the second housing to provide a flow path for fluid into the filter element. This gives passage through the filter element and then through an opening in the second housing. A combination bypass-indicator member is attached to the top of the movable filter element for guided sliding movements in the central opening of the baffle member. (Prague-FIRL)
W74-13334

UNIVERSAL BASIN FOR USE IN A SEWER SYSTEM,
For primary bibliographic entry see Field 8A.
W74-13335

PROCESS FOR THE REACTIVATION OF POWDERED CARBON,
CPC International, Inc., Englewood Cliffs, N.J. (assignee).
F. L. Corson.
United States Patent 3,816,338. Issued June 11, 1974. Official Gazette of the United States Patent Office, Vol 923, No 2, p 683-684, June 11, 1974. 1 fig.

Descriptors: *Patents, *Liquid wastes, Purification, Waste water treatment, Organic matter, Suspension, Slurries, *Activated carbon.
Identifiers: *Reactivation.

A process was patented which describes a method for the reactivation of spent powdered carbon for purification of waste waters as well as other liquids. The invention describes a continuous process for the reactivation of spent powdered carbon containing adsorbed organic matter. Particle sizes are smaller than about 100 mesh, and have a reactivation efficiency of at least about 80 percent, and a product yield of at least about 90 percent by weight. This process comprises dispersing the spent carbon in water to form an aqueous suspension with a solids content of from about 20 percent to about 35 percent by weight. The suspension is atomized with steam and the atomized suspension is passed in an atmosphere substantially free of oxygen through a radiantly heated reactor vessel, with a wall temperature of from about 1200 F to about 1900 F. A time period of from about 5 to about 30 seconds is used. The carbon to and from the reactor is handled in a slurry form, which eliminates dust losses. (Prague-FIRL)
W74-13336

TARGET SYSTEM FOR LAYING SEWER PIPES,
Laser Alignment, Inc., Grand Rapids, Mich. (assignee).
For primary bibliographic entry see Field 8A.
W74-13337

EXPERIENCES WITH BUTTERFLY VALVES,
Kansas City, Mo. Div. of Water Supply.
For primary bibliographic entry see Field 8A.
W74-13338

BASIC CHARACTERISTICS OF OZONIZERS AND EVALUATION OF 'MITSUBISHI OZONIZER',
Mitsubishi-Heavy Industries, Ltd., Omiya, (Japan). Central Research Lab.
N. Tabata, S. Yagi, S. Inoue, S. Noda, and S. Koikawa.
Mitsubishi Denki Giho, Vol 48, No 4, p 424-430, April, 1974. 17 fig, 4 tab, 7 ref.

Descriptors: *Ozone, Equipment, Water purification, Data collections, Construction materials, Performance, *Waste water treatment, Industrial wastes.
Identifiers: *Ozonizers, *Japan.

Ozonizers are recognized effective devices for purification of water and air. Their systemizing has become increasingly important with their efficiency and elargement of scale. The basic concept of discharge physics with regards to ozonizers developed by Mitsubishi Industries is examined. Fundamental data regarding ozone generating efficiency are presented; the type and construction of Mitsubishi ozonizers marketed together with ozone generation characteristics are included. (Sandoski-FIRL)
W74-13412

DEODORIZATION WITH OZONE,
Mitsubishi-Heavy Industries Ltd., Oniza, (Japan). Central Research Lab.
K. Azuma, K. Doi, M. Morikawa, and M. Kose.
Mitsubishi Denki Giho, Vol 48, No 4, p 431-437, April, 1974. 19 fig, 3 tab, 11 ref.

Descriptors: *Ozone, *Waste water treatment, Industrial wastes, Pulp and paper industry, Activated carbon, Equipment, Performance, *Odor.
Identifiers: *Deodorization.

The theory of deodorization using ozone is outlined and examples of successful deodorization of exhaust gas and waste water from kraft pulp factories and marine product processing plants are given. Similar treatment of exhaust gas from food processing works also is discussed. The possibility of accelerating the reactions on the surface of activated carbon with ozone in the case of mercaptan and hydrogen sulfide in which gas phase oxidation is too slow is explored. Finally, the manufacture of a deodorizing apparatus consisting of a scrubber with ozone dissolved water as an absorbent is examined. (Sandoski-FIRL)
W74-13413

INCINERATION OF LIQUID WASTES,
S. W. Sim.
Chemical Processing, Vol 20, No 5, p 32-34, May, 1974. 3 fig, 1 tab.

Descriptors: *Chemical wastes, *Liquid wastes, *Industrial wastes, *Incineration, Inorganic compounds, Organic compounds, *Waste water treatment, Waste Water disposal, Operating costs, Economics, Treatment facilities, Equipment, Sodium compounds, Foreign research, Effluents, Oxidation.
Identifiers: *NICE process, Chemical recovery, Japan.

A rief description is given of the operation and design of the NICE process (developed by Nittetu Chemical Engineering Co., Tokyo) for liquid waste incineration and salt recovery. The equipment consists of an incinerator lined with refractory bricks and a gas quench system. The incinerator is equipped with two fluid atomizing jets for injecting the waste into the incinerator and an auxiliary fuel burner for maintaining optimum operating temperatures. It was designed specifically for chemical effluents and is particularly suited to wastes containing inorganic salts alone or in combination with organic constituents. A table is presented listing commercially operating units. The majority of the applications are for complete destruction of organic materials in an oxidizing atmosphere, but the process can be operated under reducing conditions when treating, for example, purge liquor from coke oven gas desulfurization plants. Operating costs are given for a unit handling sodium organic effluent requiring oxidation of organic material and recovery of alkali salt for process reuse, and for a unit treating purge liquor from coke oven gas desulfurization plants. (Witt-IPC)
W74-13420

ACTIVATED SLUDGE MICROFLORA IN AERATION PONDS FOR SECONDARY PURIFICATION OF PULP AND PAPER MILL EFFLUENTS (ISSLEDOVANIE MIKROFLORY AKTIVNOGO ILA AERIRUEMYKH PRUDOB PO DOOCHISTKE STOCHNYKH VOD TSELLYULOZNO-BUMAZHNYKH PREDPRIYATII),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR).
M. A. Lomova, and R. M. Ryabkova.
Issledovaniya v Oblasti Proizvodstva Polufabrikatov i Ochistki Promyshlennykh Stokov, Sbornik Trudov VNNIB, No 61, p 211-216, 1972. 1 fig, 1 tab, 5 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Biological treatment, *Activated sludge, *Aerated ponds, *Aeration, *Microorganisms, Pulp and paper industry, Waste treatment, Industrial wastes, Treatment facilities, Foreign research, Biochemical oxygen demand, Lignins, Pollutants, Oxidation, Adaptation, Bacteria, Biodegradation, Effluents.
Identifiers: USSR, Zhidachev Pulp and Paper Mill(USSR), Kotlas Pulp and Paper Mill(USSR).

In a Soviet process for biological purification of sulfite and kraft mill waste waters, pretreatment in aeration tanks with activated sludge removes 90-92% of the 5-day BOD load, followed by further treatment of difficultly oxidizable substances, such as lignin, in aeration ponds. Studies of the pond efficiency and pond microflora were conducted under conditions of continuous flow without sludge recycling, using pretreated effluents from the Kotlas and the Zhidachev pulp and paper mills which had a pH of 7.8-9.1 and contained 15-25 mg of 5-day BOD, 1.0-1.4 mg of N, and 0.3-0.5 mg of P per liter. During the first 2 days of pond residence, the microflora remained basically the same as in the original activated sludge, although the numbers of bacteria belonging to different physiological groups differed. On the third day, an adaptation process manifested itself by the appearance of a more specific microflora comprising spore formers and lignin-utilizing bacteria. Since the oxidation rate in the pond dropped sharply after the first day, it seems that improved pond oxidation efficiencies may be obtained by preliminary adaptation of microorganisms. (Stapinski-IPC)
W74-13425

CALCULATIONS FOR DISPLACEMENT-TYPE AERATION TANKS (RASCHET AEROTENKOV-VYTESNITELEI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR).
M. A. Evilevich, L. K. Korovin, A. V. Naumov, and B. S. Pritsker.
Issledovaniya v Oblasti Proizvodstva Polufabrikatov i Ochistki Promyshlennykh Stokov, Sbornik Trudov VNNIB, No 61, p 190-204, 1972. 7 fig, 10 ref.

Descriptors: *Mathematical models, Model studies, *Activated sludge, *Waste water treatment, *Biodegradation, *Aeration, *Aerated lagoons, *Biological treatment, Treatment facilities, *Pulp wastes, Pulp and paper industry, Europe, Foreign research, Kinetics, Oxidation, Effluents, Waste treatment, Water pollution control, Pollution abatement, Sorption, Adsorption, Equations, Theoretical analysis.
Identifiers: USSR, Kotlas Pulp and Paper Mill(USSR), Freundlich equation, Monod equation.

A mathematical model is presented of the biological purification process in displacement-type aeration tanks, based on the following premises: (1) the organic loading of effluents comprises both readily and difficultly oxidizable compounds; (2) the bio-oxidation of oxidizable compounds can be represented as several superimposed parallel reactions, viz., biosorption, bio-oxidation (including biosynthesis of new cell material), and oxidation of activated sludge cells; (3) for stable bio-purification, the bulk of the sorbent (activated sludge) must be regenerated; (4) this is achieved in practice by reducing the amount of sorbed matter to 3-5% of that sorbed initially; (5) bio-oxidation of the oxidizable fraction, as measured by five-day BOD tests, must be taken into account. Theoretical analyses show that biosorption kinetics are satisfactorily described by a Freundlich equation, while bio-oxidation kinetics follow a Monod-type equation and correlate well with oxygen consumption. The model establishes a relationship between effectiveness of purification on one hand and effluent concentration, sludge volume, aeration time, and sludge plus effluent qualities on the other hand. The model was found suitable for calculating variables ofwaste water purification. Calculated data agreed well with experimental data obtained from aeration tanks operating at the Kotlas pulp and paper mill (USSR). (Stapinski-IPC)
W74-13427

LIQUID VELOCITY DISTRIBUTION IN AERATION TANKS WITH MECHANICAL AERATORS (RASREDELENIE SKOROSTEI ZHIDKOSTS V AEROTENKAKH S MEKHANICHESKIMI AERATORAMI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR).
L. I. Braginskii, M. A. Evilevich, V. I. Begachev, and V. A. Kulukhov.
Issledovaniya v Oblasti Proizvodstva Polufabrikatov i Ochistki Promyshlennykh Stokov, Sbornik Trudov VNNIB, No 61 p, 180-189, 1972. 4 fig, 9 ref.

Descriptors: *Aeration, Equipment, Treatment facilities, *Pulp wastes, *Aerated lagoons, *Operation and maintenance, Theoretical studies, *Mixing, Fluid mechanics, Flow rates, Hydraulic structures, Hydraulic machinery, Hydraulic equipment, *Waste water treatment, Biochemical oxygen demand, Energy, Turbines, Equations, Mathematical studies.
Identifiers: Pneumatic equipment, Aerators, Energy consumption.

Mechanical mixing with simultaneous air input beneath the agitator is shown to be the most economical arrangement for aeration tanks. Pneumatic-mechanical aerators can achieve significant effluent purifications (better than 2000 g of 5-day BOD/cu m/day) with a power consumption of 0.5-0.8 kw-hr/kg of 5-day BOD. Determining the optimum aerator operating variables requires calculations of hydraulic conditions in the aeration zone. A theoretical analysis was conducted of the rotary motion of liquid in pneumo-mechanical aerators. Equations were derived to describe the peripheral motion profile as a function of type and rotary velocity of the aerator and of aerator/tank dimension ratio. Results of calculations were confirmed by experimental data obtained for turbine and paddle-type aerators. (Stapinski-IPC)
W74-13428

IMPROVED CONTROL OF RADIOACTIVE WASTE AT HANFORD,
Directorate of Licensing (AEC), Bethesda, Md.
F. E. Stubblefield, and E. B. Jackson.
Available NTIS, Springfield, Va 22161 as Rept, No WASH-1315. $3.75/copy, $2.25/microfiche. Report No WASH-1315, June 1974. 29 p, 19 fig.

Descriptors: *Management, *Radioactive waste disposal, *Waste storage, *Effluents, Nuclear powerplants, Columbia River, Plutonium, Fuels, Neptunium, Uranium, Liquid wastes, Solid wastes, Gases, *Washington.
Identifiers: *Hanford Site(Wash), Fuel processing.

The Hanford Waste Management program is actively pursing a course designed for an improvement in regard to control of radioactive waste. The improved position is an interim step in some yet-to-be-determined, long-term disposal scheme. Detail is given for the chemical separations, plutonium fishing. Waste management operations which includes solid, liquid, and gaseous wastes. (Houser-ORNL)
W74-13430

PICKING THE BEST COAGULANT FOR THE JOB,
Water and Wastewater Plants, Daytona Beach, Fla.
T. P. Brodeur, and D. A. Bauer.
Water and Wastes Engineering, Vol 11, No 5, p 52-55, May, 1974. 4 fig.

Descriptors: *Coagulation, *Alum, *Costs, *Sludge, *Waste water treatment, Silica, *Florida, Filters.
Identifiers: Nalcolyte 8174, *Daytona Beach(Fla).

The problem was raised as to which chemical is most cost-effective in coagulation application. Findings are reported of a study done to try to resolve this problem. Alum has been used with great sucess by the municipalities of Daytona Beach, Florida for over 40 years. The study was conducted not so much to find something better than alum as it was to alleviate some of the drawbacks of its use. Typical problems with alum use are: dry powder causes handling problems; soluble alumina carry-through into the distribution system can cause fouling and dirty water; increased lime dosages are needed to counter the acidifying characteristics of alum; carryover of light floc reduces filter runs by formation of gelatinous layers on the bed; and sludge production with increased water flow causes crowding in the save-all tank and lagoons. The study compared plant-scale application of aluminum sulphate, activated silica, and a high molecular weight anionic polymer (Nalcolyte 8174). (Shaffer-FIRL)
W74-13433

FILTER AND CENTRIFUGES FOR THE DEHYDRATION OF WASTE WATER SLUDGES (FILTER UND ZENTRIFUGEN FUER DIE ENTWAESSERUNG VON ABWASSERSCHLAEMMEN),
F. Rueb.
Wasser Luft und Betrieb, Vol 18, No 5/6, p 279-282, 289, 1974. 9 fig.

Descriptors: *Dehydration treatment facilities, *Filters, *Centrifugation, *Sludge, Solid wastes, *Waste water treatment.
Identifiers: Germany.

Thin sludges left from various water purification processes must be thickened for deposition in sanitary landfills or other kinds of disposal including reuse. This had frequently been accomplished by drying in drying beds. Machines such as filter presses, drying drums, belt filter presses and sludge centrifuges gained recent increasing interest. Filter presses proved very efficient with dewatering sludges from pickling stations or galvanizing stations. A special construction is the tower filter press comprising two vertical filtering belts. The thin sludge enters on top and proceeds downward between the two belts which in the lower section exert a pressure of 1.8 to 2.5 bar. The filter cake falls out at the bottom. The tower filter press combines hydrostatic and mechanical pressure. The operating principles of drum filters, the belt filter press and the centrifuge are reviewed and illustrations of these machines are given. (Shaffer-FIRL)
W74-13434

HOW TO CURTAIL OR END DISCHARGES OF SEWAGE FROM SHIPS.
For primary bibliographic entry see Field 5G.
W74-13436

ALL PROCESSES CENTRALLY CONTROLLED AND MONITORED, (NORWICH CORPORATION).

Descriptors: *Sewage treatment, *Treatment facilities, *Automation, Computers, Sludge treatment, Equipment, Monitoring, Waste water treatment.
Identifiers: United Kingdom.

The sewage treatment facilities at Norwich, England are currently being extended to treat 55,000 cu m/day DWF of sewage from a contribution population of 197,000 persons. There are two treatment plants. One has circulation sedimentation radial flow tanks, biological filters and humus tanks with effluent pumping facilities, and the other has circular radial flow sedimentation tanks, diffused air activated sludge plant, and final settlement. The processes have been automated and interlinked into one central control system, the Kent K70 system, which has a complete range of both hardware and software for computer process control. The system is compatible with most digital computers. (Merritt-FIRL)

W74-13438

SEVEN ARCHES WORKS, (WALTON AND WEYBRIDGE).
Water and Waste Treatment, Vol 16, No 12, p 20-22, December, 1973.

Descriptors: *Treatment facilities, *Sewage treatment, Rivers, Storm water, Filters, Storage tanks, Sedimentation, Water purification, Water quality standards, Percolation, Filters, Biochemical oxygen demand, Activated sludge, Sludge treatment, Aeration, Suspended solids.
Identifiers: Kitwe(Zambia), Borough of Mossley, Lancashire(England), Seven Arches(England).

Sewage treatment works are described at Seven Arches, Weybridge, Surrey; the Borough of Mossley in Lancashire, and at Kitwe, Zambia. At Seven Arches no storm water is discharged into the River Wey. Overflows pass through two storm water tanks. The supernatant liquor is mixed with the primary sedimentation tanks effluent and then passes through the filters. An average of 15/15 standard is being achieved. At Mossley, the existing works were reconstructed and modernized due to increases in domestic and industrial wastes in the 1950's. By 1972 there was need for further extension or modernization. As a temporary measure a Flocor Roughing Filter Tower is being incorporated between the sedimentation tanks and the percolating filters. This substantially reduces the BOD content of the sewage which enables the existing filter beds to produce a much improved quality of effluent. The new works at Zambia are based upon the treatment of sewage in a two stage activated sludge process, where the first stage consists of biological filters which are intended to act in parallel with the secondary aeration tanks. (Merritt-FIRL)
W74-13439

L500,000 SLUDGE TREATMENT PLANT, (ROCHESTER, CHATHAM AND GILLINGHAM JOINT SEWERAGE BOARD).
Water and Waste Treatment, Vol 16, No 12, p 17, 19, December, 1973.

Descriptors: *Sludge treatment, *Treatment facilities, Filtering, Lime, Sludge disposal, Water pollution control, Estuaries, Design data, *Waste water treatment.
Identifiers: Iron sulfate, United Kingdom.

The design and operation of the recently completed sludge treatment and pressing plant at the Motney Hill Treatment Works of the Rochester, Chatham, and Gillingham Joint Sewage Board (England) are described. The installation will chemically condition and press the sewage sludge separated out at the treatment works. The sludge pressing plant forms part of the program of major extensions to the Motney Hill sewage treatment works to enable it to cater to the expanding population of the Medway Towns. The existing works serves a current population of approximately 215,000 and provides for comminution, grit removal, preaeration and primary settlement of the sewage before it is discharged to the River Medway. Additions are scheduled for the primary and sludge treatment facilities and the construction of a partial secondary treatment plant designed to hold the pollution load on the estuary at its present level. The following processes at the plant are described: existing sludge treatment, new sludge treatment arrangements, screening and copperas conditioning, lime conditioning, filter presses, sludge feed to the presses, sludge disposal, liquor treatment, conditioning agents, and the building services. (Merritt-FIRL)
W74-13440

80/80 STANDARD INTO BRISTOL CHANNEL (YEO VALLEY MAIN DRAINAGE SCHEME).
Water and Waste Treatment, Vol 16, No 12, p 7-9, December, 1973.

Descriptors: *Sewerage, *Treatment facilities, Design data, Equipment, Filtration, Sedimentation, *Sludge treatment, Activated sludge, Biological treatment, Pumping station, Filters, Sewage, Storage tanks, Organic matter, Pipelines, Remote control, Electricity, *Waste water treatment.
Identifiers: Barminutors, Recorders, Detritor, United Kingdom.

The Yeo Valley Main Drainage Works at Kingston Seymour, Clevedon, Somerset are described. The effluent discharges to an estuary into the Bristol Channel. The works has been designed to hydraulically handle a maximum rate of flow of 1578 liters/sec or six times ultimate dry weather flow to allow for storm flows from the old combined sewerage systems connected into the new regional scheme. The treatment consists of maceration, grit removal, filtration through high rate polyvinyl chloride filters, sedimentation and discharge through an effluent pipeline to the head of the Kingston Pill. Sludge is disposed of by heat treatment conditioning followed by filter pressing to produce a sterile sludge cake with a moisture content of 50% suitable for disposal to tip. Specifically described are the sewage treatment processes, biological oxidation, settlement, sludge disposal, inlet pipes, inlet pumping station, recorders, barminutors, detritors, filters pumping station, filters, humus tanks, booster pumping station, outfall pipeline, sludge pumping station, sludge holding tanks, transfer sludge pumping station heat treatment plant, administration building, and the remote control system, and the electricity supply and services. (Merritt-FIRL)
W74-13441

AN EXPERIMENTAL IRRADIATION FACILITY FOR THE STERILIZATION OF SEWAGE SLUDGE,
Bayerische Landesantalt fuer Bodenkultur und Pflazenbau, und Pflanzen Schutz, Munich (West Germany).
A. Suss, H. Moetsch, E. Bosshard, G. Schurmann, and O. Luescher.
Kerntechnid, Vol 16, No 2, p 65-70, January, 1974. 4 fig, 11 ref.

Descriptors: *Sludge treatment, *Treatment facilities, *Radiation, Agriculture, Design data, Sewage sludge, Sterilization, *Waste water treatment, Equipment, Evaluation, Costs.
Identifiers: *Germany(Geiselbullach).

An experimental irradiation facility for the sterilization of sewage sludge was designed and built at the sewage treatment plant of the Ampergrouppe in Geiselbullach. It is at present equipped with a 120 kCi Co 60 source and can process a daily flow of about 30 cu m sewage sludge at an exposure of 300,000 R. The treatment capacity of the facility can be raised for four or five times the present level without any structural alterations by using a stronger source. The main components of the facility consist of the irradiation shaft with a built in central tube in which the sludge is recirculated during irradiation and the recirculation system consisting of an accessible pump shaft with the recirculation and evacuation pumps, the necessary shutoff and regulation valves and pipework. (Merritt-FIRL)
W74-13442

SEWAGE AERATOR - WITH SUBMERGED MOTOR CARRIED BY FLOATS.
German Patent 1,957,793. Issued December 13, 1973. German Patents Abstracts, Vol U, No 51, p 1, January, 1974.

Descriptors: *Sewage, *Equipment, *Aeration, *Patents, Treatment methods, *Waste water treatment.

A sewage aerator with a submerged motor carried by floats is described. The motor, and the vane wheel mounted above it and driven by it, are enclosed in common by an open-ended sheathing ring between which and the motor are guide walls. When seen in cross section, the walls run radially relative to the motor. Preferably, the upper open end of the rings consists of a mouthpiece which widens toward the outside. (Merritt-FIRL)
W74-13443

ODOR ELIMINATION BY OZONE (OZON-HONI YORU AKUSHU JOKYO),
T. Azuma.
Kankyo Sozo, Vol 4, No 2, p 79-84, February, 1974. 10 fig, 2 tab, 13 ref.

Descriptors: *Ozone, *Sewage treatment, *Waste water treatment, *Odor, *Water pollution effects, *Treatment methods, Organoleptic properties.

Ozone deodorization is achieved by by both oxidation and neutralization. Most effectively neutralized or decomposed odors are mercaptans, sulfides, amines such as trimethylamine and dimethylamine, phenol, and low class nonsaturate hydrocarbons. Ozone deodorization is effective in emission sources with these odor elements, such as sewages, Kraft pulp mills, and fishmeal processing plants. The chemical formulas are presented. Odor emission sources in the environment in all cases produce complex odors, and ozone oxidation seldom achieves complete deodorization. The process therefore is often combined with a pre- or post-treatment system. The most common combination is with a scrubber. The basic structure of a deodorization system comprises an aeration tank, an ozone aeration tank, an ozonizer, and a neutralization tank with alkaline solution. Various odors were treated by a special deodorization system comprising a scrubber with ozone and alkaline solution, a demister, and an activated carbon layer. The scrubber absorbed amine and other soluble odors, and the liquid interface achieved oxidation decomposition; activated carbon oxidized and adsorbed sulfides and other nonsolubles, and decomposed excess ozone. The results show that an appropriate amount of ozone (5 ppm) could deodorize 98.7 percent of 15 ppm triethylamine, 90-95 percent of 4.5 ppm hydrogen sulfide, and close to 100 percent of 3.2 ppm methylmercaptan. This system was applied to the treatment of exhaust from the trickling filter of a sewage treatment plant. The gas odor concentration can be significantly reduced to by 5 ppm of ozone. (Seigle-FIRL)
W74-13448

DEVICES FOR THE PRE-DILUTION OF SEWAGE AT SUBMERGED OUTFALLS,
Water Pollution Research Lab., Steverage (England).
A. R. Agg, and W. R. White.
Proceedings of the Institution of Civil Engineers, Vol 57, Part 2, p 1-20, March, 1974. 15 fig, 4 tab, 7 ref.

Descriptors: *Model studies, *Waste water treatment, *Mathematical studies, *Outfall sewers, Sewers, Sewage treatment, *Waste dilution.
Identifiers: *Submerged outfalls.

An analysis and arrangement of the parameters governing the dilution of sewage discharged from submerged outfalls is presented. This form of display indicates that the most efficient outfall in terms of maximum dilution at the water surface operates at a densimetric Froude number of unity. Six possible designs for devices to achieve predilution of sewage before discharge from a submerged outfall are also described, and comparative experiments in a physical model to assess their performance are reported. Experiments carried out subsequently on four variations of the most promising device are also compared. The efficiency of the device in increasing dilution at the surface in different depths of water is discussed. (Murphy-FIRL)
W74-13450

METHANE PRODUCTION FROM WASTE,
University Coll. of South Wales and Monmouthshire, Cardiff.
D. A. Stafford.
Effluent and Water Treatment Journal, Vol 14, No 2, p 73-75, 77, 79, February, 1974. 4 fig, 4 tab, 15 ref.

Descriptors: *Methane, *Sewage treatment, *Microbiology, Domestic wastes, Costs, Decomposing organic matter, Anaerobic bacteria, Anaerobic digestion, Organic wastes, Methane bacteria, Biochemistry, *Waste water treatment.
Identifiers: Hydrolysis/gas production, Digestor gas production.

Much of the fundamental microbiology is not yet known for the organisms involved in the production of methane. In order to use domestic sewage as a source of power, research must be done to solve the practical problems of operating a two stage hydrolysis/gas production anaerobic digesting plant. The methane bacteria have the reaction: 4H2 + CO2 yields 2H20 + CH4, common to different species of anaerobic organisms in degrading organic carbon. Discussed are the nutrient requirements of the bacteria, practical applications of anaerobic digestion, inhibitors of digestion gas production, and the financial considerations and market potential for the use of these processes. (Prague-FIRL)
W74-13452

USABLE WATER FROM RAW SEWAGE,
Florida Inst. of Tech., Melbourne. Univ. Center for Pollution Research.
D. D. Woodbridge, L. A. Mann, and W. R. Garrett.
Bull Environ Contam Toxicol. Vol 7, No 2/3, p 80-86, 1972.

Descriptors: *Potable water, Water reuse, *Irradiation, Waste water treatment, Filtration.

Usable water can be obtained by the irradiation process. Use of sewage effluents for industrial purposes would require filtering following the irradiation. Water to be returned to a source stream should be filtered. Filtration treatment can be achieved such that the water will meet potable standards.--Copyright 1973, Biological Abstracts, Inc.
W74-13459

DISPOSAL OF PEACH CANNERY WASTE BY APPLICATION TO SOIL,
North Carolina State Univ., Raleigh.
R. P. Gambrell, and T. C. Peele.
J Environ Qual. Vol 2, No 1, p 100-104, 1973, Illus.

Descriptors: *Peaches, Industrial wastes, Waste water treatment, *Canneries, Ammonium salts, Aeration, *Waste water disposal, Chemical oxygen demand, Nitrates.
Identifiers: Land disposal.

The chemical oxygen demand (COD) of liquid peach cannery waste was significantly reduced by forced aeration of the liquid for 72 hr and was further reduced by the addition of 20 and 200 ppm N from NH4NO3. Eight applications of peach cannery waste were made to soil columns of a sandy clay and a sand subsoil. Soil columns 8.26 cm (3.25 in.) in diameter having lengths of 25.4, 50.8, and 76.2 cm (10, 20, and 30 in.) received the waste at a rate of 2.54 cm/hr (1 in./hr) for 3 hr/application. The effects of soil texture, length of column, plus the addition of NH4NO3 to the waste and CaCO3 to the soil on COD, pH and electrical conductivity of the percolate were evaluated. Generally, as the column length increased, the COD of the percolate decreased. The sandy clay was more effective than the sand in reducing the COD of the percolate. The average reduction for the 50.8 cm (20 in.) columns was 90% for the sandy clay and 70% for the sand. The addition of N to the waste significantly reduced the COD of the percolate while the addition of CaCO3 to the soil had no appreciable effect. The pH of the waste was reduced from an average of 10.9 to about 7.0 by passage through the soils. The pH of both soils was increased considerably by the waste applications and the pH of the sandy clay remained above 7.0 after being leached with distilled water. The percent of aggregates larger than 1 mm was increased by the peach waste applications while the aggregates less than 0.02 mm were not appreciably affected.--Copyright 1973, Biological Abstracts, Inc.
W74-13460

5E. Ultimate Disposal Of Wastes

ECONOMIC COSTS OF WATER QUALITY PROTECTION ON DAIRY FARMS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
M. Ashraf, and R. L. Christensen.
Water Resources Bulletin, Vol 10, No 2, p 318-328, 1974. 1 fig, 6 tab, 5 ref.

Descriptors: *Costs, *Dairy industry, *Farm wastes, *Waste disposal, Farm management, Land management, Cost analysis.
Identifiers: *Manure disposal, Land spreading.

Estimates of direct investment expenses and the economic implications to the dairy business of adopting alternative manure disposal systems to reduce water pollution are reviewed. Although existing manure disposal technologies include physical conversion, biological processes and conventional disposal, only the land spreading alternative was extensively evaluated. Operating and capital costs of two types of storage, stacking and liquid, utilizing hauling machinery capable of carrying 105, 175 and 320 bushels and 1500, 2100 and 3000 gallons, respectively, were considered. Three alternative time lags between spreading and incorporation into the soil were also evaluated. Results indicate the reduction in net farm income will range from $10-$29/cow with adoption of the stacking system and $33-$51/cow for the liquid system. Small and medium size farms (under 100 cows) may experience a significantly smaller reduction in farm income compared to large farms. The implementation of a disposal system may also affect cropping practices, partially as a result of competition for labor. On small and medium free stall farms the incorporation of a disposal system without plowing could reduce corn acreage by 9%. With plowing down manure 19% of corn acreage could be converted to hay crops. (Schroeder-Wisconsin)
W74-12788

AQUACULTURE IN ALASKA.
Alaska Univ., College. Inst. of Marine Science.
Public Information Bulletin 73-1, June 1973. 19 p. 7 fig.

Descriptors: *Wastes, *Aquiculture, *Recycling, Alaska, Fish farming, Industrial wastes, Fish management, Municipal wastes, Fisheries, Salmon, Organic wastes, Fish hatcheries, Shellfish farming, Heated water, Shrimp, Legal aspects, Administration.
Identifiers: *Waste utilization.

The development of technology to utilize existing feedstuffs and energy, both natural and industrial, in the development of aquaculture in the Alaskan coastal zone are summarized. Several biological species including salmon, six Alaskan and one exotic bivalves, five shrimp species, two edible members of the echinoderm class and a profusion of seaweeds could be compatible with the Alaska ecosystem. Waste products presently produced in Alaska may be recycled for either direct use by these cultivated organisms or used to manufacture bulk feeds for aquaculture or other animal uses. Wastes byproducts including excess heat from generating plants, organic matter from pulp mills, nitrogen discharged as ammonia from the petrochemical industry and treated wastes can be utilized as valued inputs for Alaska's aquaculture. In addition, the new industries could generate year round jobs for the approximately 20,000 underemployed fisheries-related workers along the Alaskan coasts. Institutional questions covering regulation of the new industries and of the waste byproducts are still to be answered. Recommendations include the establishment of demonstration products designed to evaluate the economic justification of processing animal feeds from processed fish wastes and impoundment systems for production of aquacultural seed stocks and market-ready commodities. (Schroeder-Wisconsin)
W74-12791

CONFERENCE ON RECYCLING TREATED MUNICIPAL WASTEWATER THROUGH FOREST AND CROPLAND.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W74-12869

THE SOIL AS A CHEMICAL FILTER,
Michigan State Univ., Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5D.
W74-12873

THE SOIL AS A BIOLOGICAL FILTER,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-12874

SITE SELECTION CRITERIA FOR WASTEWATER DISPOSAL -- SOILS AND HYDROGEOLOGIC CONSIDERATIONS,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
For primary bibliographic entry see Field 5D.
W74-12875

RENOVATION OF MUNICIPAL WASTEWATER THROUGH LAND DISPOSAL BY SPRAY IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-12876

RESTORATION OF ACID SPOIL BANKS WITH TREATED SEWAGE SLUDGE,
Forest Service (USDA), Harrisburg, Ill. Shawnee National Forest.
For primary bibliographic entry see Field 5D.
W74-12879

MICROBIAL HAZARDS IN DISPOSING OF WASTEWATER ON SOIL,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-12884

VEGETATION RESPONSES TO IRRIGATION WITH TREATED MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W74-12885

ANATOMICAL AND PHYSICAL PROPERTIES OF RED OAK AND RED PINE IRRIGATED WITH MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W74-12886

SPRINKLER IRRIGATION SYSTEMS: DESIGN AND OPERATION CRITERIA,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W74-12888

IMPLEMENTING THE CHICAGO PRAIRIE PLAN,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-12892

MUNICIPAL WASTEWATER DISPOSAL ON THE LAND AS AN ALTERNATE OF OCEAN OUTFALL,
Bauer Engineering, Inc., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-12896

MICHIGAN'S EXPERIENCE WITH UTILIZING THE TEN STATES GUIDELINE FOR LAND DISPOSAL OF WASTEWATER,
Michigan Dept. of Public Health, Lansing. Div. of Wastewater.
For primary bibliographic entry see Field 5D.
W74-12898

RESEARCH NEEDS--LAND DISPOSAL OF MUNICIPAL SEWAGE WASTES,
Forest Service (USDA), Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-12901

WASTE WATER TREATMENT AND SLUDGE DISPOSAL AT THE CESKA KAMENICE PAPER MILL (CISTENI ODPADNICH VOD A LIKVIDACE SEDIMENTU V ZAVODE 25. UNORA V CESKA KAMENICI),
Ceska Kamenice Paper Mill (Czechoslovakia).
For primary bibliographic entry see Field 5D.
W74-12921

WASTEWATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-12938

WASTEWATER TREATMENT: LAND DISPOSAL OF WASTEWATER,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5D.
W74-12940

THE DISPOSAL OF WASTE IN THE OCEAN,
Southern California Coastal Water Research Project, Los Angeles.
W. Bascom.
Scientific American, Vol 231, No 2, p 16-25, Aug., 1974. 13 fig.

Descriptors: *Oceans, *Waste disposal, *Water pollution, Legislation, Pollutants, Radioactive wastes, Halogenated pesticides, DDT, Chlorinated hydrocarbon pesticides, Organic compounds, Polychlorinated biphenyls, Toxins, Marine microorganisms, Water quality standards, Water pollution sources, Oil pollution, Oil spills, Litter, Solid wastes, Heavy metals, Water pollution control, Municipal wastes, Ships, Water pollution effects, Industrial wastes, Aesthetics, Litter.

Contrary to some widely held views, the ocean is the plausible place for man to dispose of some of his wastes. To protect both the land and the sea, in the long run, man must (1) clearly define what is ocean, separating it from inland freshwaters and from harbors and shallow bays, and make laws that are appropriate for each environment, (2) avoid the assumption that anything added to the ocean is necessarily harmful and consider instead what substances might cause damage and eliminate excesses of them, (3) rigorously prohibit the disposal in the ocean of all man-made radioactive materials, halogenated hydrocarbons (such as DDT and polychlorinated biphenyls) and other synthetic organic materials that are toxic and against which marine organisms have no natural defenses, (4) set standards based on water quality that are compatible with what is known about the threshold of damage to marine life, providing a safety factor of at least 10, (5) work to obtain international cooperation in prohibiting ships from disposing of litter or oil and from pumping bilges, (6) set aside ocean areas of deep water and slow current where certain materials can be dumped with minimal damage, (7) require each discharger to make studies to demonstrate how his specific effluent will influence the adjacent ocean, (8) support additional research on the effect of pollutants on the ocean and its life, and (9) anticipate pollutants that may become serious as technology produces new chemical compounds in greater quantities. (Witt-IPC)
W74-12956

AN OBSERVATION OF RAPID THERMOCLINE FORMATION IN THE MIDDLE-ATLANTIC BIGHT,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5B.
W74-13005

QUARTERLY PROGRESS REPORT STUDIES ON MANAGEMENT OF SELECTED WASTES - JANUARY THROUGH MARCH 1974.
Battelle-Pacific Northwest Lab., Richland, Wash. Nuclear Waste Technology Dept.
For primary bibliographic entry see Field 5D.
W74-13106

DECONTAMINATION AND DENSIFICATION OF CHOP-LEACH CLADDING RESIDUES,
Battelle-Pacific Northwest Lab., Richland, Wash. Nuclear Waste Technology Dept.
For primary bibliographic entry see Field 5D.
W74-13107

WASTE TREATMENT AND HANDLING PROCESSES,
Battelle-Pacific Northwest Lab., Richland, Wash. Nuclear Waste Technology Dept.
For primary bibliographic entry see Field 5D.
W74-13108

TRITIUM SEPARATION AND FIXATION,
Battelle-Pacific Northwest Lab., Richland, Wash. Nuclear Waste Technology Dept.
For primary bibliographic entry see Field 5D.
W74-13109

SURVEY OF MERCURY USAGE BY AGENCIES OF THE UNITED STATES GOVERNMENT DURING 1971,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-13113

AQUEOUS PROCESSING OF LMFBR FUELS TECHNICAL ASSESSMENT AND EXPERIMENTAL PROGRAM DEFINITION SECTION 4.4 AND 5.4.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D.
W74-13131

QUARTERLY PROGRESS REPORT - RESEARCH AND DEVELOPMENT ACTIVITIES, WASTE FIXATION PROGRAM, JANUARY THROUGH MARCH 1974.
Battelle-Pacific Northwest Lab., Richland, Wash. Nuclear Waste Technology Dept.
For primary bibliographic entry see Field 5D.
W74-13132

TECHNICAL AND SOCIAL ASPECTS OF NUCLEAR WASTE DISPOSAL IN WESTERN EUROPE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5D.
W74-13135

HYDROLOGIC PERSPECTIVE OF SURFICIAL WASTE DISPOSAL,
Geological Survey, Tampa, Fla.
For primary bibliographic entry see Field 5D.
W74-13210

MCA ENDORSES WASTE DISPOSAL PROVISIONS.
Chemical and Engineering, Vol 52, No 30, p 5, July 29, 1974.

Descriptors: *Legislation, *Solid wastes, *Waste disposal, Industrial wastes.
Identifiers: *Manufacturing Chemists Association.

Legislation dealing with the safe disposal of solid wastes has received endorsement by the Manufacturing Chemists Association (MCA). Next to toxic substances control legislation, legislative proposals for extending the solid waste act and strict management of hazardous solid wastes rank highest of environmental legislative concerns. Defining product compositions based upon either wastes produced in their manufacture or resource recovery potential is of great importance to the MCA. (Sandoski-FIRL)
W74-13291

INJECTING HIGHLY TREATED SEWAGE INTO A DEEP-SAND AQUIFER,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W74-13310

DESIGN, DRILLING AND COMPLETION, OPERATION, AND COST OF UNDERGROUND WASTE DISPOSAL WELLS IN GULF COAST REGION OF TEXAS AND LOUISIANA,
Pollution Control and Waste Disposal, Inc., New Orleans, La.
For primary bibliographic entry see Field 5B.
W74-13340

IMPROVED CONTROL OF RADIOACTIVE WASTE AT HANFORD,
Directorate of Licensing (AEC), Bethesda, Md.
For primary bibliographic entry see Field 5D.
W74-13430

80/80 STANDARD INTO BRISTOL CHANNEL (YEO VALLEY MAIN DRAINAGE SCHEME).
For primary bibliographic entry see Field 5D.
W74-13441

METHANE PRODUCTION FROM WASTE,
University Coll. of South Wales and Monmouthshire, Cardiff.
For primary bibliographic entry see Field 5D.
W74-13452

DISPOSAL OF PEACH CANNERY WASTE BY APPLICATION TO SOIL,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 5D.
W74-13460

5F. Water Treatment and Quality Alteration

THE POLITICAL INFLUENCE OF RESIDENTIAL CONSUMERS ON WATER RATES,
West Virginia Univ., Morgantown. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W74-12786

STUDIES ON THE MICROBIOLOGICAL CHARACTERISTICS OF WATERS USED BY DEFENCE SERVICES IN ASSAM,
A. L. Nair, D. Bhuyan, and H. B. Das.
Armed Forces Med J India. Vol 28, No 2, p 231-249, 1972.

Descriptors: Coliforms, *E. coli, Microbiology, Bacteria, Water pollution effects, *Water treatment.
Identifiers: Assam, India, *Streptococci.

Water samples (138) sent by various Army/Air Force Units were subjected to microbiological analysis which showed 90.3% of the treated and 69% of the untreated water samples to be free from coliforms and fecal streptococci and hence bacteriologically safe for drinking purposes. Escherichia coli was absent in 96.7% of the treated and in 91.1% of untreated samples tested. Only 1 sample showed MPN (most probable number) of E. coli above 100/100 ml of water. Fecal streptococci were absent from 93.6% of the treated and 82.2% of the untreated water samples. Heavy pollution with coliforms appeared in 4.3% of the treated and 13.3% of the untreated samples. Similarly 2.1% of the treated and 11.1% of the untreated samples showed pollution with fecal streptococci, the MPN values for 100 ml being above 100 in all these cases. Maximum values of MPN index recorded for coliforms, E. coli and fecal streptococci were 1100 plus 110 and 460 respectively. High incidence of fecal streptococci was accompanied with high total bacterial load in the samples. Treatment given to raw waters was sufficient for elimination of pollution with fecal indicator bacteria in those cases where such organisms were present.--Copyright 1973, Biological Abstracts, Inc.
W74-12965

THE RELATIONSHIP OF LAND USE TO DOMESTIC SURFACE WATER SUPPLY IN GEORGIA,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 4A.
W74-13047

EFFECT OF OZONATION ON HUMAN ENTERIC VIRUSES IN WATER FROM RHODE ISLAND RIVERS,
Rhode Island Univ., Kingston. Dept. of Animal Pathology.
P. W. Chang.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 421 $3.25 paper copy, $2.25 in microfiche. Completion Report, July 1974. 19 p, 2 fig, 11 tab, 1 ref. OWRT B-47-RI(1). 14-31-0001-3933.

Descriptors: *Ozone, *Rhode Island, Enteric bacteria, *Viruses, *Water treatment.
Identifiers: *Ozonation, *Saugatucket River(RI), *Enteric viruses.

Partially purified Poliovirus type 1, 2 and 3; Coxsackie virus type B3 and B5; echovirus type 12 and 29, and adenovirus type 7a were studied for their sensitivity to ozone in either ozone demand-free distilled water or Saugatucket River Water. An ozone sparging rate of one gram per hour was used. Viruses were sampled at various intervals during ozonation and assayed. The different viruses varied in their sensitivity to ozone and ranged from one to 14 minutes for their inactivation. The time required to inactive viruses in river water was in most cases twice as long as that required for the ozone demand-free distilled water.
W74-13056

THE RELATIONSHIP BETWEEN SEWERS, ENVIRONMENTAL POLLUTION AND BACTERIA THAT ARE RESISTANT TO ANTIMICROBIAL AGENTS, (IN AFRIKAANS),
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5B.
W74-13158

DRINKING WATER AS A SOURCE OF LEAD POLLUTION,
Glasgow Univ. (Scotland). Dept. of Materia Medica.
For primary bibliographic entry see Field 5B.
W74-13234

TREATMENT OF WATER OR AQUEOUS SYSTEMS,
Ciba-Geigy Corp., Ardsley, N.Y. (assignee)
For primary bibliographic entry see Field 5D.
W74-13256

SYSTEM FOR MONITORING AND CONTROLLING SUBSTANCES IN FLUID BODIES,
For primary bibliographic entry see Field 7B.
W74-13262

THE IMPORTANCE OF DRINKING-WATER PROGRAMS TO THE TOTAL ENVIRONMENTAL GOAL,
South Carolina State Government, Columbia.
For primary bibliographic entry see Field 5G.
W74-13266

THE HAZARD OF IRON,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5B.
W74-13269

VIRUSES--WHAT IS THEIR SIGNIFICANCE IN WATER SUPPLIES,
Environmental Protection Agency, Boston, Mass. Region I.
For primary bibliographic entry see Field 5C.
W74-13272

WATER-TREATMENT-PLANT WASTES DISPOSAL-PART 1,
Malcolm Pirnie, Inc., Paramus, N.J.
G. P. Westerhoff, and M. P. Daly.
Journal of the American Water Works Association, Vol 66, No 5, p 319-324, May, 1974. 6 tab, 4 ref.

Descriptors: *Treatment facilities, *Waste water treatment, Construction, Equipment, Design criteria, Filters, Sludge treatment, Investigations, Polyelectrolytes, Water treatment, Water supply, Potable water.

The Sturgeon Point Water Treatment Plant, located about 15 miles south of Buffalo, New York, treats raw water from Lake Erie and is the principal source of potable water for the Erie County Water Authority. The water authority presently serves about 426,100 persons and is constructing and evaluating primary concentration facilities for achieving a zero discharge of waste water to Lake Erie. The first phase of the program was to construct primary waste water-concentration facilities for interim lagooning until the second phase could be designed and constructed. phase 1 facilities included a 210x60-foot one-story waste water treatment building, two holding basins, two 200x200x10-foot and one 150x200-foot earth lagoons, three 40-foot-diameter clarifier-thickeners equipped with upflow clarifiers, two 15.5-foot high x 7-foot-diameter sludge holding tanks, and various pumps, piping, and valves for transferring the wastes between the various treatment units. These facilities are designed to achieve a degree of liquid-solids separation. The liquid phase of the waste water is returned to the plant raw water; the solids are concentrated and stored in lagoons. (Sandoski-FIRL)
W74-13284

RECOVER ALUM TO REDUCE WASTE-DISPOSAL COSTS,
Metcalf and Eddy, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-13285

THIS WATER FILTER CLEANS ITSELF,
Whitman and Howard, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W74-13332

POLLUTION CONTROL: THE RELATION OF WATER QUALITY PROTECTION TO EXPLORATION FOR AND PRODUCTION OF OIL AND GAS IN THE SOUTHWEST,
Texas Water Commission, Austin.
For primary bibliographic entry see Field 5G.
W74-13342

CHARACTERISTICS OF THE ACTION OF DISTILLED DRIMKING WATER ON THE STATE OF THE GASTROINTESTINAL TRACT, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W74-13374

COMPARISON OF THE EFFECTS OF FLUORIDE DRINKING WATER ON CARIES FREQUENCY AND MOTTLED ENAMEL IN THREE SIMILAR REGIONS OF AUSTRIA OVER A 10-YEAR PERIOD,
K. Binder.
Caries Res. Vol 7, No 2, p 179-183. 1973.
Identifiers: *Austria, *Caries, *Fluoride, Fluorosis, Public health, *Potable water, Water treatment.

There are 2 regions in Austria where the natural F(-2) content of drinking water is within optimal levels (1-2 ppm): A, Carinthia-district center Mallnitz (1.0 ppm F). B, Tyrolia-district center Silz (1.5 ppm F) and Umhausen (1.8 ppm). A 3rd region contains an above optimal level of F(-1): C, Lower Austria-District center Seefeld (3.0 ppm F). An epidemiological survey was carried out regarding the effects of natural F(-1) in drinking water in relation to dental caries and fluorosis. Experimental and control groups in about equal numbers, were present in each of the 3 districts. The experimental groups consisted of children living in houses connected with the municipal water supply, the F(-1) content of which remained constant, within a variation of plus or minus 0.20 ppm F, during the 10-yr period. The difference between the DMFT (decayed-missing-filled teeth) values of the test groups and the corresponding controls remained practically the same during the test

period but caries frequency increased in all groups to a lesser degree in Mallnitz than in Silz and Umhauser. Whereas 10 yr ago the children of 1.0 ppm F) had higher DMFT than in B(1.5 ppm F) and (1.8 ppm F), the conditions are now reversed. The reason for the increase of DMF numbers in all groups is the increase of sugar consumption in B compared with A. The influence of oral hygiene and nutrition could be responsible for the effect that in 1969 the children of A had better teeth than the children of B. Although the children of C consumed frequent in between snacks, neglected their teeth badly, never used a toothbrush and had very few cavities filled, the high level of F(-1) in the drinking water resulted in figures comparable to those of B 10 yr ago, i. e. lower DMF rates and higher mottling rates.--Copyright 1973, Biological Abstracts, Inc.
W74-13398

USABLE WATER FROM RAW SEWAGE,
Florida Inst. of Tech., Melbourne. Univ. Center for Pollution Research.
For primary bibliographic entry see Field 5D.
W74-13459

DETERMINATION OF NITRATE NITROGEN IN DRINKING-WATER BY CADMIUM-COPPER REDUCTION, (IN JAPANESE),
Aichi Prefecture Inst. of Public Health, Nagoya (Japan).
For primary bibliographic entry see Field 5A.
W74-13498

5G. Water Quality Control

STATE-COUNTY INTERAGENCY PROCEDURES FOR IMPOSING ENVIRONMENTAL QUALITY CONTROLS ON WATER-ORIENTED DEVELOPMENT ACTIVITIES,
Whittenburg, Vaughan Associates, Inc., Landover, Md.
W. S. Vaughan, Jr., H. A. Blanchard, and A. S. Mavor.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 299, $4.75 paper copy, $2.25 in microfiche. Completion Report, July 1974. 94 p, 6 fig, 7 tab, 50 ref. OWRT C-4262(9041)(1).

Descriptors: *Governmental interrelations, *Interagency cooperation, *Environmental control, *Local governments, *State governments, *Regulation, Coordination, Decision making, Governments, Institutions, Permits, Control, *Maryland, Wetlands, City planning, Coastal structures, Inland waterways, Water pollution control.
Identifiers: *Anne Arundel County(Md), Environmental procedures, Environmental control criteria.

Project purpose was to describe and evaluate the system of agencies, criteria and procedures which control water-oriented development in Anne Arundel County, Maryland. Environmental-quality oriented constraints which serve to counter pressures for development of the waterfront were emphasized. Two main categories of development were examined: (1) construction of piers and bulkheads involving dredging, filling and spoil disposal; and (2) planning of large-tract waterfront subdivisions involving water appropriation, sewerage systems, waterway construction, flood plain and open space preservation, grading and storm water runoff, and community marinas. County, State and Federal agencies involved in the control system are identified and their functions described. Control criteria imposed by each agency are listed and compared. Procedural steps for processing development applications are presented in flow diagrams. The case study method was the principal source of descriptive information, supplemented by interviews with developers, conservationists and control agency personnel, and by reviews of Federal, State and local laws, regulations and ordinances. Analysis of the description revealed considerable redundancy in the criteria imposed by the control agencies and a confusion among developers as to how to proceed through the three-layered review process. Means to improve system efficiency are recommended.
W74-12751

DISPOSAL OF HEATED WATER THROUGH GROUNDWATER SYSTEMS - VOL. I: TECHNICAL AND ECONOMIC FEASIBILITY,
Kansas Univ., Lawrence. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W74-12753

DISPOSAL OF HEATED WATER THROUGH GROUNDWATER SYSTEMS, VOLUME II, USER'S MANUAL NUMERICAL SIMULATION OF FLUID FLOW AND HEAT TRANSFER IN GROUNDWATER SYSTEMS,
Kansas Univ., Lawrence. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W74-12754

POLLUTION MANAGEMENT IN THE COASTAL STATES,
Coastal States Organization, Savannah, Ga.
T. H. Suddath.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Resenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 42-47.

Descriptors: *Continental margin, *Coasts, *Management, *Pollution abatement, State governments, Water pollution control, Air pollution, Natural resources, Recreation, Great Lakes, Institutions, Regulation, Planning, Administration, Decision making.
Identifiers: *Coastal zone management.

Pollution management in coastal states involves a delicate balancing of diverse user goals in the defined coast zone. The Coastal Zone Organization, which is composed of representives from coastal and Great Lakes states, has sought to facilitate debate on the appropriate coastal zone management goals and implementation tools. Issues raised by the organization include how strongly should controls be exercised; how should management and regulatory responsibilities be divided among levels of government; how should each state's participation be organized and how far inland and seaward should planning and controls be extended. In developing a state organization the stress is that all interests must be represented. A four step hierarchy is suggested: After the state defines its coastal zone it should be placed under the jurisdication of a Coastal Zone Management Authority; reporting to the authority would be local planning commissions. A state Environmental Protection Agency would be charged to assess environmental impacts, funnel environmentally related funding, and act as an appeal board for local residents. The final organizational stage would be a state Environmental Quality Council whose duties would include adjudication and recommendation to the governor courses of action where disputes occur with local interests and the federal government. (Schroeder-Wisconsin)
W74-12767

THE THRESHOLD OF ENVIRONMENTAL REASON,
Corps of Engineers, Atlanta, Ga. South Atlantic Div.
For primary bibliographic entry see Field 6G.
W74-12768

FOOD AND DRUG ADMINISTRATION GUIDELINES FOR CONTAMINANTS IN FISHERY PRODUCTS,
Food and Drug Administration, Washington, D.C. Bureau of Foods.
A. C. Kolbye, Jr.
In: Proceedings of the 24th Annual Session of Gulf and Caribbean Fisheries Institute, November 1971, Rosentiel School of Marine and Atmospheric Sciences, University of Miami, Coral Gables, Florida, p 81-84.

Descriptors: *Federal government, *Regulation, *Commercial fishing, Mercury, Water pollution, Public health, Shellfish, Standards, Fish handling facilities, Canneries, Pesticide residues, Hazards, Polychlorinated biphenyls, Heavy metals.
Identifiers: *Seafoods.

Traditionally the Food and Drug Administration's approach to fish products has centered on microbiologic quality, generally in-plant sanitation. Unlike other protein sources however, fish are grown and harvested in a relatively uncontrolled environment. Thus FDA's approach has had to expand from in-plant examination to an active fresh-water pesticide analysis program. In Fiscal Year 1971, 600 fish samples were analyzed for pesticides with almost all containing residual level of DDT or its analog; 346 of the samples contained PCB (1254) an industrial contaminant. In addition to these programs the FDA initiated a compliance program in 1970 to determine the extent of mercury contamination of fishery products. Examination of the canned tuna market between Dec. 16, 1970 and Feb. 1, 1971 revealed only 4% exceeded existing guidelines. Extention of the sampling program revealed that less than 5% of swordfish samples were within FDA's 0.5 ppm guideline. Further survey of salt water fish indicated that while their mean mercury level is low, snapper, bonito and mackerel levels were likely to exceed FDA's guidelines. Development of these guidelines is also reviewed. Guidelines are generally developed based on research considering the impact of mercury on humans. (Schroeder-Wisconsin)
W74-12770

INDUSTRY ACTIVITIES IN RESPONSE TO THE HEAVY METALS PROBLEM IN SEAFOODS,
National Fisheries Inst., Inc., Washington, D.C.
L. J. Weddig.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 85-92. 20 ref.

Descriptors: *Commercial fishing, *Heavy metals, *Regulation, Water pollution, Public health, Marketing, Standards, Mercury, Fish handling facilities, Economics.
Identifiers: *Seafoods, Tuna, Swordfish, Food and Drug Administration.

After the 1970 discovery that a variety of fresh water and marine fish contained mercury levels in excess of FDA guidelines, and Food and Drug Administration and the fisheries industry took a number of steps to reduce the hazard and economic loss. The tune industry immediately established procedures to segreate contaminated fish, resulting in only a small inventory loss. The contaminated swordfish problem was not so easily salvaged. FDA samples showed problem included: (1) notification to foreign producers to cease shipping (95% of all swordfish are imported); (2) shipments on the water were either returned to home ports or held at the port-of-entry for testing; and (3) testing was begun on the 2-4 million pound cold storage inventory. In the end most of the product exceeding guideline specifications was returned to Japan. Disposal cost for the industry were estimated to exceed $1 million. Besides these 'bail-out' programs, long range programs have

been developed to (1) assess the extent of heavy metal in fishery products; (2) source of the heavy metal and it's impact on humans and (3) to inform the public of the industry's good faith attempts. (Schroeder-Wisconsin)
W74-12771

GUIDELINES FOR DEVELOPING OR REVISING WATER QUALITY STANDARDS, UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
Environmental Protection Agency, Washington, D.C. Div. of Water Planning.
EPA Report, January 1973, Amended April 1973, 39 p.

Descriptors: *Water quality standards, *Regulation, *Legislation, Water quality control, Legal aspects, *State governments, *Water policy.

Contents consist of definition of Waters covered by the act; Objective, goals and policies; Policy guidelines including stream use classification policy, Implementation plan policy, Water quality criteria policy, Antidegradation policy, and General policies, i.e., minimum acceptable standards, interstate consistency, etc.; and Legislative requirements including interstate standards, existing intrastate standards, and new intrastate standards. (See also W74-12798) (EPA)
W74-12797

WATER QUALITY STRATEGY PAPER, SECOND EDITION, A STATEMENT OF POLICY FOR IMPLEMENTING THE REQUIREMENTS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS AND CERTAIN REQUIREMENTS OF THE 1972 MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT.
Environmental Protection Agency, Washington, D.C. Div. of Water Planning.
EPA Report, March 15, 1974, 82 p.

Descriptors: *Water quality standards, *Legislation, *Federal Water Pollution Control Act, *Regulation, *Comprehensive planning, Budgeting, Government finance.

This second edition of the Water Strategy has been prepared for use and review by Federal, State, and local government officials, and for the information of the public. It reflects the final decisions on the Federal Government's FY 1975 budget. Major changes to the 1973 edition have been made, and the discussion has been broadened to include several new areas of program activity. The principal emphasis of the Strategy is on the implementation of the Federal Water Pollution Control Act, for which EPA has the major Federal responsibility. EPA's role under the Marine Protection, Research, and Sanctuaries Act in regulating ocean dumping is also included, however. Specific programs governing the protection of public water supplies are not addressed. (See also W74-12797) (EPA)
W74-12798

HYDRODYNAMIC REGIMES OF SUBSURFACE RETURN FLOW,
Howard Univ., Washington, D.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W74-12843

COSTS OF LAND SUBSIDENCE DUE TO GROUND WATER WITHDRAWAL,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4B.
W74-12867

FINANCING MUNICIPAL WASTE WATER TREATMENT FACILITIES, INCLUDING LAND UTILIZATION SYSTEMS,
Environmental Protection Agency, Washington, D.C. Div. of Municipal Waste Water Programs.
For primary bibliographic entry see Field 5D.
W74-12890

FOREST SERVICE POLICY RELATED TO THE USE OF NATIONAL FOREST LANDS FOR DISPOSAL OF WASTEWATER AND SLUDGE,
Forest Service (USDA), Washington, D.C. Div. of Watershed Management.
For primary bibliographic entry see Field 5D.
W74-12899

SPRAY IRRIGATION--THE REGULARTORY AGENCY VIEW,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Ground Water Quality Management Unit.
For primary bibliographic entry see Field 5D.
W74-12900

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED BYRON STATION UNITS 1 AND 2, COMMONWEALTH EDISON COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-12902

THE FLOW OF MERCURY IN SOCIETY,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-12919

MAN BITES DOG: THE TALE OF HOW A PULP MILL WAS RESCUED FROM BEING POLLUTED TO DEATH,
Alliance Paper Mills Ltd., Merritton (Ontario).
A. E. H. Fair.
Pulp and Paper Magazine of Canada, Vol 75, No 4, p 35, April 1974.

Descriptors: *Industrial water, *Pulp wastes, Pulp and paper industry, *Clogging, Equipment, *Water supply, Water resources development, *Hydroelectric plants, *Canals, Surge tanks, Hydraulic structures, Engineering structures, Penstocks.

When the water supply of Alliance Paper Mills dwindled in the 1930's, owing to diversion of shipping canal waters to a hydroelectric power plant, increasing amounts of previously deposited fibrous sludge plugged a gravity filter and passed into food-wrapping paper. Freshwater flow from a new canal was secured for papermaking with permission from the power company to tap the base of a surge tank at the end of a penstock. (Brown-IPC)
W74-12955

FEDERAL ASSISTANCE PROGRAMS FOR WATER POLLUTION CONTROL TECHNOLOGY DEVELOPMENT,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
F. G. Hurtubise, and A. R. Townshend.
Paper presented at 1974 Annual Conference, Pollution Control Association of Ontario, May 1-3, 1974. Toronto, Ontario. Published June 1974. 30 p, 10 tab.

Descriptors: *Pollution abatement, Programs, *Grants, Governments, *Federal government, *Administrative agencies, *Canada, *Research and development, Projects, Planning, Financing, Treatment facilities, Waste water treatment, Waste treatment, Procurement, Contracts, Contract administration.

The Canadian Federal Government offers several assistance programs to encourage universities, research centers, consultants, industries, and municipalities to conduct research and development on improved wastewater treatment processes and equipment. An outline is presented of such programs administered by Environment Canada, CMHC (Central Mortgage and Housing Corp.), the National Research Council of Canada, and other agencies. Program expenditures and typical funded projects are illustrated. The role of the Science Procurement Sector, Department of Supply and Services in coordinating unsolicited R and D proposals and in obtaining contract work for government agencies is explained. (Brown-IPC)
W74-12959

SUMMERTIME ARTIFICIAL AERATION INCREASES WINTER OXYGEN LEVELS IN A MICHIGAN LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. Fast.
Prog Fish-Cult. Vol 35, No 2, p 82-84, 1973. Illus.

Descriptors: *Aeration, Fish, Fishkill, Lakes, Winterkilling, Summer, *Oxidation, Oxygen, Michigan, Microorganisms, *Mortality.
Identifiers: Artificial.

Three mo. of summertime artificial aeration using compressed air resulted in a large increase in winter O2 concentrations during ice cover. This increase is attributed to a more thorough oxidation of organic matter with a resultant decrease in the winter O2 consumption rate, and a larger reserve of O2 at the time of ice cover. Both of these conditions are attributed to artificial aeration which may prevent winterkill of fishes.--Copyright 1973, Biological Abstracts, Inc.
W74-12968

DYNAMIC ANALYSIS AND OPTIMAL FEEDBACK CONTROL SYNTHESIS APPLIED TO BIOLOGICAL WASTE TREATMENT,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-13026

A STUDY OF HOW WATER QUALITY FACTORS CAN BE INCORPORATED INTO WATER SUPPLY ANALYSIS,
Ernst and Ernst, Washington, D.C.
J. M. Greene.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-782 870, $6.25 in paper copy, $2.25 in microfiche. Army Engineer Institute for Water Resources, Fort Belvoir, Va, Contract Report 74-2, July, 1973. 3 vol, 164 p, 7 fig, 8 tab, 50 ref. Contract No DACW71-72-C-0053.

Descriptors: *Water supply development, *Water quality, *Water demand, *Linear programming, Optimization, Methodology, Standards, Pollution abatement, Water quantity, Marginal cost, Equations, Resource allocation, Planning, Systems analysis, Mathematical models.
Identifiers: *Economic analysis, *Cost minimization, Constrained utility-maximization, Constrained profit-maximization, Production functions, Water quality upgrading, Water quality index, Comparative statistics, Equilibrium analysis.

Presented is a three-volume study which examines the feasibility of embedding quality parameters explicity in water supply analyses. A microeconomics approach using constrained optimization is employed. Volume One presents water supply function conceptual theory and methodology by means of classical economics model (CEM) derivation of a treatment plant's marginal cost function with a water quality-related

parameter incorporated explicitly. A linear programming model (LPM) is developed to demonstrate how it is possible to depict internal behavior by a water-using producer, who can alter his 'effective' supply by upgrading lower quality water to higher acceptable quality. Volume Two is the empirical implementation of Volume One. For the CEM, actual data are used to help estimate a sample cost function, while dummy data enable demonstrating the sensitivity capabilities of the LPM. Both models permit estimating costs of removing water contaminants. Volume Three gives the conceptual justification for water demand functions (for consumers and producers) with explicit quality parameters incorporated. Hypothetical examples are given and combined with Volume Two's CEM to examine by means of comparative statics analysis the sensitivity of 'marginal revenue-marginal cost' equilibrium to quality parameter shifts. Throughout the study, a measure of turbidity concentration is used as the illustrative quality parameter, but the conceptual feasibility of alternative forms is discussed. (Bell-Cornell)
W74-13030

THE RELATIONSHIP OF LAND USE TO DOMESTIC SURFACE WATER SUPPLY IN GEORGIA,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 4A.
W74-13047

POWERS OF THE STATE OF KENTUCKY IN IMPLEMENTING AN EFFLUENT TAX AS A PART OF AN INTERSTATE OHIO RIVER BASIN WATER POLLUTION CONTROL PROGRAM,
Kentucky Univ., Lexington. Water Resources Research Inst.
A. L. Morse.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 407, $4.25 paper copy; $2.25 microfiche. Research Report No 76, September 1974. 57 p, 151 ref. OWRT A-053-KY(1). 14-31-0001-4017.

Descriptors: Legislation, Legal aspects, Financing, Water law, Water policy, Water resources development, *Kentucky, Water pollution control, Regulation, *Pollution taxes(Charges), Available water, Institutional constraints, Surface water availability.

Problems and solutions involved in financing and regulating water quality control are described. The purpose is to record some of the major problems confronting those who legislate water quality, those who espouse technological answers, and those who see the problem in terms of economic solutions. The limits placed by political and institutional constraints on solutions to these problems are frequently not understandable. Within this report are contained separate investigations: a study of federal-interstate relations and the interstate compact; a study of Kentucky's common law approach to water rights; a study of financing water quality under Kentucky statutes; and a summary and analysis. Each of these areas touches on problems involved in the planning process; in this context, the following problems are considered: (1) The availability of water. (2) Water and economic development. (3) Water and the environment. (4) Responsibilities for water resources development. (5) Legal framework for development. (6) Financing water resource development. (7) Political and institutional constraints. (Grieves-Kentucky)
W74-13051

WASTEWATER SYSTEM ALTERNATES: WHAT ARE THEY...AND WHAT COST,
Anderson-Nichols and Co., Boston, Mass. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W74-13071

WASTEWATER SYSTEM ALTERNATES: WHAT ARE THEY...AND WHAT COST,
Anderson-Nichols and Co., Boston, Mass. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W74-13072

EFFICACY OF SOME METHODS CONTROLLING LEECHES IN WATER,
Wyzsza Szkola Rolnicza, Lublin (Poland). Zaklad Chorob Ryb.
M. Prost, M. Studnicka, and J. Niezgoda.
Aquaculture, Vol 3, No 3, p 287-294, June 1974, 1 tab, 6 ref.

Descriptors: *Pesticides, *Animal parasites, Chemcontrol, Hydrogen ion concentration, Ammonia, Calcium hydroxide, Larvae, Fish disease, Lime, Laboratory test, Water pollution contol.
Identifiers: *Leeches, Desiccation, Quicklime, 'Neguvon'-Bayer, Piscicola geometra.

Experiments were carried out on the influence of quicklime, ammonia water, 'Neguvon'-Bayer and desiccation on the vitality of leeches. The efficacy of quicklime depends on its CaO content, on the dose of this compound, and above all, on the pH of calcium hydroxide formed by mixing quicklime with water. The borderline value in this case is pH=8.6. Quicklime containing 99% CaO proved the most effective in destroying mature leeches and their cocoons; at the concentration of 250 ppm, it produces a pH higher than 8.6. In acceptable doses, ammonia water is ineffective while 'Neguvon'-Bayer is useful against mature leeches only. Under laboratory conditions, drying up kills leech larvae in 24 hours. This is therefore a radical means of combatting these parasites. (Katz)
W74-13096

THE INTERAGENCY CONFERENCE ON THE ENVIRONMENT - A POST-CONFERENCE SURVEY,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6G.
W74-13118

TRANSURANIC SOLID WASTE MANAGEMENT RESEARCH PROGRAMS - QUARTERLY REPORT, OCTOBER-DECEMBER 1973.
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W74-13120

NEW ENERGY TECHNOLOGY RESEARCH AND DEVELOPMENT: A RATIONALE FOR SETTING PRIORITIES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6B.
W74-13123

EFFLUENT CONTROL IN FUEL REPROCESSING PLANTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D.
W74-13127

CHEMICAL ENGINEERING DIVISION WASTE MANAGEMENT PROGRAMS QUARTERLY REPORT, OCTOBER-DECEMBER 1973,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5D.
W74-13128

A PROPOSED INTERIM STANDARD FOR PLUTONIUM IN SOILS,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W74-13136

HABITATS OF SMALL MAMMALS AT WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
For primary bibliographic entry see Field 5C.
W74-13137

RECLAMATION STUDIES ON BLACK MESA,
Arizona Univ., Tucson. Dept. of Watershed Management.
J. L. Thames, and E. J. Crompton.
Progressive Agriculture in Arizona. Vol 26, No 1, p 14-16, January-February, 1974. 4 fig.

Descriptors: *Strip mines, *Revegetation, *Mine wastes, *Reclamation, *Soil physical properties, Small watersheds, Reclamation, Runoff, Surface water, Soil moisture, Water yield, Erosion, Sedimentation, Soil properties, Arid lands, *Arizona, Coal mines.
Identifiers: *Black Mesa(Ariz).

A research project was initiated to obtain hydrologic and soil material data in areas mined for coal in order to develop mining practices favorable to surface mine reclamation. Water and its conservation was determined to be the critical factor for determining the success or failure of a reclamation project in the arid environment. The intended goal in the Black Mesa area is to develop the reclamation sites into range land for sheep. Two experimental watersheds were used, one on recontoured mine land, and another on nearby undisturbed land. Both were instrumental to monitor various hydrologic parameters. Preliminary results show that the mine soil's lack of structure caused some puddling and surface crusting; however, the mine soil showed a high hydrologic potential and adequate nutrient level, particularly due to its great depth, for good range production. (Mastic-Arizona)
W74-13144

DRAINAGE AND LAND RECLAMATION IN THE LOWER MESOPOTANIAN PLAIN,
International Agricultural Centre, Wageningen (Netherlands).
For primary bibliographic entry see Field 4A.
W74-13148

SUMMARY OF WATER QUALITY STANDARDS FOR THE INTERSTATE WATERS OF IOWA,
Environmental Protection Agency, Washington, D.C.
Available NTIS, Springfield, Va 22161 as PB-230 284, Price $3.75 printed copy; $2.25 microfiche. Environmental Protection Agency, Water Quality Standards Summary Report EP 1.29 (Iowa Water Pollution Control Commission Io-9), June 1972. 27 p, 3 fig, append.

Descriptors: *Water pollution control, *Iowa, *Water Quality Act, Federal Water Pollution Control Act, Waste treatment.

Water quality standards adopted by Iowa for its interstate waters were submitted to the Department of the Interior in May 1967. On January 16, 1969, the Secretary of the Interior approved the standards. The standards consist of three major components: designation of the uses which interstate waters are to serve, specification of narrative and numerical criteria to protect and enhance water quality, and specification of a plan of implementation and enforcement, which includes treatment and control requirements for municipal, industrial and other wastes discharged to or affecting interstate waters. (Knapp-USGS)
W74-13185

INFLUENCE OF RECHARGE BASINS ON THE HYDROLOGY OF NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-13206

INTERIM EFFLUENT GUIDANCE FOR NPDES PERMITS,
Environmental Protection Agency, Washington, D.C. Permit Program Div.
R. B. Schaffer.
Available from NTIS, Springfield, Va 22161 as PB-227 001, Price $5.25 printed copy; $2.25 microfiche. 1973, 122 p.

Descriptors: *Water pollution control, *Pollution abatement, *Permits, Regulation, Industrial wastes, Waste water treatment.

General guidance is given for permit applications to the Environmental Protection Agency for all industrial categories of effluent discharges. The guidance documents were developed to cover, as specifically as possible, the identified industrial categories. Permits are to be written with limitations in terms of mass of each pollutant per day excepting in certain industries (such as mining operations and utility discharges) where wastewater generation is not related to production levels. (Knapp-USGS)
W74-13214

P, N:P STANDARDS FOR HAWAIIAN STREAMS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W74-13217

ARE THE GREAT LAKES THREATENED,
Canada Centre for Inland Waters, Burlington (Ontario).
J. P. Bruce, and G. F. Gabriel.
Journal of the American Water Works Association, Vol 66, No 5, p 298-301, May 1974. 4 fig, 1 ref.

Descriptors: *Great Lakes, *Water pollution, *Water utilization, *Water demand, *Water pollution control, Eutrophication, Lakes, United States, Canada, Treaties, Water supply, Water sources, Water quality, Water quality standards, Water quality control, Water purification, Pollution abatement, Environmental effects, Water pollution treatment, Water treatment, Adoption of practices, Public benefit, Recreation, Economic aspects.

Although the water of most of the Great Lakes is still of good quality many problems have developed in near shore areas. More extensive implementation of pollution control measures on this lake system should be a matter of urgent concern. The lakes are used for many purposes including public and industrial water supplies, recreation, shipping, power production and commercial fishing. Some of the more important problems facing the Great Lakes are eutrophication, organic contamination, presence of trace metals, oil pollution and bacterial contamination. The water quality of the Great Lakes is indeed threatened for many uses, including community water supply uses. However a recently signed agreement between Canada and the United States, which established jointly agreed water quality objectives and control programs, should resolve many of the problems if properly executed. (Ritchie-Florida)
W74-13218

METHODS AND PROBLEMS OF ESTIMATING WATER-QUALITY BENEFITS,
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
F. H. Abel, and D. P. Tihansky.
Journal of the American Water Works Association, Vol 66, No 5, p 276-281, May, 1974. 20 ref.

Descriptors: *Water quality, *Water quality control, *Cost-benefit analysis, *Cost-benefit theory, Costs, Economics, Cost-benefit ratio, Feasibility, Project planning, Social aspects, Environmental effects, Water policy, Water supply, Water management(Applied), Planning, Water resources development, Comprehensive planning, Natural resources.

The demand for water quality improvement programs necessitates the development of methods for estimating benefits of such programs against their costs. There are several methods in use that deal with both tangible and intangible benefits. In some cases these benefits outweight any cost. All of these procedures are part of a benefit-cost analysis. Pollution is the result of man's activities as they affect the quality of water. Methods of estimating benefits include dose-response relationships, market assessments, willingness to pay surveys and variations of the Delphi technique. There are two primary ways to measure costs: the firm-accounts approach and the engineering approach. Hopefully these techniques will yield solutions with maximum net socioeconomic benefits. (Ritchie-Florida)
W74-13219

THE ENVIRONMENT AND WATER-RESOURCE DEVELOPMENT,
National Wildlife Federation, Washington, D.C.
L. S. Clapper.
Journal of the American Water Works Association, Vol 66, No 5, p 291-292, May 1974. 1 photo, 2 ref.

Descriptors: *Environment, *Environmental effects, *Water resources, *Water resources development, *Planning, Conservation, Organizations, Water pollution, Water pollution control, Project planning, Ecology, Legal review, Water demand, Water management(Applied), Water quality, Water supply, Adoption of practices, Comprehensive planning, Water law, Water policy.

Those who are interested in preserving the environment do not necessarily have to be in conflict with those who want to develop resources. Good planning, public participation, and environmental awareness can enhance the environment without halting progress. Currently, the National Wildlife Federation (NWF) is involved in a number of lawsuits to stop the development of certain water-resource development projects. To NWF, conservation does not necessarily mean 'pure preservation', even though it seems water-development projects should stand on its own merits, with benefits being weighed against costs, and including both economic and probable adverse impacts on the environment. NWF has also recommended the incorporation of the concept of life-cycle planning. Such planning would require quantitative evaluation of environmental impact during the planning, exploration, construction and operation of any water-resource project. (Ritchie-Florida)
W74-13221

PROPOSITION ONE--FOR NEW YORK'S ENVIRONMENT,
D. Sive, F. Demeree, and L. Robbins.
Environmental Quality News (Supplement to the Conservationist), August-September, 1972. 4 p.

Descriptors: *New York, *Legislation, *Bond issues, *Public benefits, *Pollution control, Water law, Land management, Water quality control, Natural resources, Public lands, State governments, Feasibility, Financial feasibility, Pollution abatement, Recycling, Solid wastes, Air pollution, Water pollution, Water pollution control, Political aspects, Government finance.

To continue the financing of its environmental programs, New York proposed a $1.15 billion bond issue, which is known as Proposition One. The 1972 Environmental Bond Coalition advocates Proposition One because the bond issue would provide assistance to communities in constructing new sewage treatment facilities and would augment the 1965 Bond Act. The 1965 Bond Act was a joint federal-state project. Proposition One, however, is entirely a state project. The new bond issue would provide money to abate air pollution from public sources such as schools, hospitals, prisons and municipal incinerators. None of the money would alleviate pollution from private industry or automobiles. Proposition One would provide money to aid communities in designing and constructing solid waste recycling facilities. Finally, Proposition One could provide money to acquire forest preserve lands, fresh water and marine wetlands, unique natural areas, access to new fishing and recreation areas, and urban land for city parks. This part of the Proposition is eligible for federal matching funds. (Barnes-Florida)
W74-13222

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 38 No 98, p 13528-13540, May 28, 1973.

Descriptors: *Regulation, *Federal Water Pollution Control Act, *Administration, *Adoption of practices, Administrative agencies, Decision making, Planning, Coordination, State government, Federal government, Permits, Water policy, Navigable waters, Oceans, Federal reservations, Water law, Conservation, Water resources development, Construction Political aspects, Legal aspects, Environmental effects, Environmental sanitation, Notice, Contiguous zone.
Identifiers: *Administrative regulations.

The Environmental Protection Agency proposed policies and procedures for the National Pollutant Discharge Elimination System pursuant to the Federal Water Pollution Control Act. Written comments on the proposed rules were invited and some comments have been adopted or substantially satisified. The permit program on the state level should not be inconsistent with the guidelines for state permit programs. The regulations prescribe the policy and procedures to be followed in connection with applications for federally issued permits authorizing discharges into the navigable waters, the waters of the contiguous zone and the oceans, during the periods the Administrator is authorized to issue such permits. Similar regulations were also issued to cover discharges of any agency of the federal government. The regulations do not prescribe policy or procedures for the issuance of permits by states under programs approved by the Administrator. The requirement that joint federal-state agreement be published in the Federal Register has been deleted. Now any agreement consistent with the regulations is valid without publication. (Sperling-Florida)
W74-13228

METHODS TO EXPEDITE ENVIRONMENT PROTECTION: INTERNATIONAL ECOSTANDARDS,
Food and Agriculture Organization of the United Nations, Rome (Italy).
P. Contini, and P. H. Sand.
American Journal of International Law, Vol 66, No 1, p 37-59, 1972. 128 ref.

Descriptors: *international law, *Treaties, *Adoption of practices, *Environmental control, *Standards, Federal government, Environmental effects, Environment, International commissions, Water quality standards, Administration, Water

pollution, Water quality, Federal jurisdiction, Radioactive wastes, Industrial wastes, Oil pollution, Pollution abatement, Regulation, Water law, Air pollution.

The traditional treaty making process is inadequate for implementing international ecostandards. The ratification process is so long that the proposed standards are out of date before they take effect. Alternative approaches to the traditional treaty making process do exist and are used in other fields such as the Universal Postal Union and the International Civil Aeronautics Organization. In the alternative form the actual environmental protection standards are in the form of appendices formulated by scientists, not lawyers. The body of the treaty contains procedure for adoption of new standards and other means for arriving at agreement. There are basically three types of standards in such treaties, mandatory standards, and potentially mandatory standards. Potentially mandatory standards are the most common. This type provides for a period in which a participating nation may opt to dissent and not be bound, but upon expiration of the period, non-dissenters will be bound by the provisions. Once having agreed upon standards, each nations is independent to statutorily implement those ecostandards in any way it desires. (Barnes-Florida)
W74-13229

YOUR LAKE INSURANCE POLICY,
9 Minnesota Dept. of Natural Resources, St. Paul. Div. of Waters, Soils and Minerals.
For primary bibliographic entry see Field 6F.
W74-13231

THE CONFLICT BETWEEN CONSUMPTION AND POLLUTION,
Stanford Univ., Calif.
R. N. Fleming, and R. H. Pantell.
IEEE Transactions on Systems, Man, and Cybernetics, Vol SMC-4, No 2, p 204-208, March, 1974. 7 fig, 5 ref.

Descriptors: *Water consumption, *Water pollution control, *Mathematical models, *Computers, Planning.
Identifiers: *Food consumption, Steady-state solution, Critical parameters.

The United States is concerned about controlling pollution without excessive decreases in consumption. In this correspondence a technical relationship between consumption and pollution is defined. A utility function indicates the manner in which consumption should vary with time so as to maximize utility. It is assumed that a specified pollution level is to be achieved at the termination of a given planning period, and the problem is to obtain the optimum path of this objective. As a special case, a steady-state solution is obtained, which specifies the most desirable constant levels of consumption and pollution. Critical parameters athat enter into this solution are the discount (or appreciation) rate for the future, the decay lifetime for the pollutant, and the rate of change of pollution generation with respect to consumption. In addition, a closed-form solution is obtained for the low-pollution case, which indicates that the optimum consumption function decreases with increasing time. Computer solutions are given for the general case with several different values of critical parameters. (Prague-FIRL)
W74-13236

OIL/WATER SEPARATION ACCELERATION MEDIA,
Oil Mop, Inc., New Orleans, (assignes).
H. M. Rhodes.
United States Patent 3,810,832. Issued May 14, 1974. Official Gazette of the United States Patent Office, Vol 922, No 2, p 593, May, 1974. 1 fig.

Descriptors: *Separation techniques, *Patents, Flow, Equipment, Filaments, *Oil wastes, Oil pollution, *Pollution abatement, *Waste water treatment.
Identifiers: *Polypropylene, Acceleration media, Flow vector, Linear flow, Oil-water separation.

Media is directed to an apparatus for accelerating the separation of oil from oil/water mixtures. This brings the oil to the surface over a short a linear distance as possible in a linear flow of a mixture of oil and water. The process is accomplished by directing the oil/water mixture through a barrier of filaments of polypropylene arranged across the path of the mixture flow; the barrier is anchored at its base at the bottom of the fluid confining means by an API oil separator, a ditch, or a canal. The free ends of the strips of polypropylene are directed upward, forming an inclined plane up which the oil droplets amalgamate. These are assisted by the buoyancy of the oil and the force flow vector of the mixture passing through the fluid confining means. (Prague-FIRL)
W74-13243

ENVIRONMENTAL CONTROL EQUIPMENT.
For primary bibliographic entry see Field 5D.
W74-13263

ENVIRONMENTAL ASSESSMENT OF WATER-SYSTEM IMPROVEMENTS,
East Bay Municipal Utility District, Oakland, Calif.
D. G. Larkin, and W. F. Anton.
Journal of the American Water Works Association, Vol 66, No 5, p 282-285, May, 1974. 4 fig, 5 ref.

Descriptors: *Water resources development, *Environmental control, *Project planning, Construction, Design criteria, Costs, *California.
Identifiers: *Environmental assessment.

The East Bay Municipal Utility District (EBMUD) in California has adopted a policy and detailed procedures to provide environmental assessment of its programs and projects. The environmental assessment process provides a further tool for the planning design team considering water system improvements. It improves and widens the planning perspective, results in design that is in harmony with the surroundings, and requires construction practices most compatible with the environment. However, more time is required from project commitment or budget approval for project construction, and to add to the total project costs. It is estimated that EBMUD spends over $2000 per month in direct costs for environmental assessment. (Sandoski-FIRL)
W74-13265

THE IMPORTANCE OF DRINKING-WATER PROGRAMS TO THE TOTAL ENVIRONMENTAL GOAL,
South Carolina State Government, Columbia.
E. E. Morris, Jr.
Journal of the American Water Works Association, Vol 66, No 5, p 270-271, May, 1974.

Descriptors: *Water quality control, *Water quality standards, Project planning, *Potable water, Long-term planning.

The United States water quality has declined and environmental concern has increased during the past few years. Overall programs are the best answer to these problems, especially in light of the complexity of chemical and bacterial contaminants. Problems and programs illustrating requirements and control measures are cited. (Sandoski-FIRL)
W74-13266

THE WATER INDUSTRY IN THE DECADE OF ENVIRONMENTAL CONCERN,
Gilbert (J.B.) and Associates, Sacramento, Calif.
J. B. Gilbert.
Journal of the American Water Works Association, Vol 66, No 5, p 272-274, May, 1974.

Descriptors: *Industries, *Administration, *Management, Water supply, *Environmental effects, *Water pollution control, Waste water treatment, Water resources, Project planning.

Many of the larger states have moved to change their organizations and establish new water management agencies, but few if any have combined in one organized program all the decisions that affect their water supply. Because the crisis in the water part of the environment has centered around such incidents as the Santa Barbara oil spill, the eutrophication of Lake Erie, and the calfaction of fresh water streams, the focus of public attention has been on state and national pollution control programs. As a result, national appropriations, enforcement authorities, planning programs, and related activities are becoming the focal point of the United States' effort to manage its water resources. It is suggested that the water industry should respond to the changes in public awareness and demands by participating in new organizations, planning programs, and joint efforts with waste water agencies. (Sandoski-FIRL)
W74-13268

NEW LEGAL APPROACHES TO ENVIRONMENTAL CONTROL,
New York State Dept. of Environmental Conservation, Albany.
F. X. Wallace.
Hudson River Colloquium, Annals of the New York Academy of Sciences, Vol 250, p 182-185, May 24, 1974.

Descriptors: *Regulation, *Legal aspects, *New York, Legislation, Pollution abatement, Law enforcement, Penalties(Legal), *Water pollution control, Environmental control.

Presently there are about 200 air, water, and solid waste cases being conducted in New York state, with many more being prepared for legal action in the field. Since orders that are based merely upon agreements on necessary steps have not proved entirely effective, a new approach calls for financial guarantees that will ensure timely compliance. Under this method , industries and municipalities tnat have been found to be polluting are afforded the option of consenting to a commissioner's order and posting a financial guarantee of their compliance such as a surety bond or other security. If the polluter complies with the terms of the order, the amount is refunded. If the violation continues and the polluter does not comply with the terms of the order, the bond or security is automatically forfeited and additional steps are taken. This new approach increases the polluter's sensitivity to the need for compliance. It also shifts the burden of monitoring pollution abatement to the polluter, by requiring that periodic reports be submitted, documenting the steps taken to comply with the commissioner's order to abate pollution. Other areas which give leverage to the enforcement division are the refusal to allow operation and maintenance grants and the issuance of permits for sewer line extensions. (Sandoski-FIRL)
W74-13271

ENVIRONMENTAL-IMPACT ASSESSMENT FOR PLANT DESIGN AND OPERATION,
Jones and Stokes Associates, Inc., Sacramento, Calif.
R. L. Jones.
Journal of the American Water Works Association, Vol 66, No 5, p 286-290, May, 1974. 2 tab, 10 ref.

Descriptors: *Design criteria, *Specifications, Environmental control, Environmental effects, Planning, Treatment facilities.
Identifiers: *Environmental impact statement(EIS).

Environmental assessments have had a considerable amount of leverage in minimizing environmental deteriments and realizing benefits. Most government agencies and many private concerns are trying to deal effectively with environmental problems and identify the project features. Environmental impact statements (EIS) should be well-conceived and cover all impacts, whether positive or negative, that a planned project will have upon its area. A description of EIS preparation is given. (Sandoski-FIRL)
W74-13273

CLOUDS IN THE CRYSTAL BALL,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6D.
W74-13277

LITIGATION UNDER PL 92-500: A STATUS REPORT,
W. L. Rawls.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1646-1648, July, 1974.

Descriptors: *Legal aspects, *Federal Water Pollution Control Act, Administration, Environmental control, Municipalities, Industries, State governments.

A corresponding surge in litigation has been witnessed in the second year following the 1972 amendments to the Federal Water Pollugion Control Act. Grievances of the plaintiffs, including states, municipalities, environmentalists, and industries, have all centered on the issue of administrative flexibility and discretion under the law. States have confined their litigation to funding and permits for federal facilities. Setbacks and victories of the environmentalists with regards to the 1972 amendment are mentioned stressing the importance of the legality of EPA's variance clause for its Section 304 guidelines and its permit regulation exempting certain classes of agricultural point sources and silvacultureal and storm sewer point sources. There have been isolated challenges to individual industrial permits but the consent decrees negotiated have added nothing in the way of importance to case law. Although no legal briefs have been filed concerning effluent guidelines, preliminary motions broadly outline the position industry will assume. (Sandoski-FIRL)
W74-13289

MCA ENDORSES WASTE DISPOSAL PROVISIONS.
For primary bibliographic entry see Field 5E.
W74-13291

RESEARCH AND DEVELOPMENT,
Water Pollution Research Lab., Stevenage (England).
A. L. Downing, and D. H. A. Price.
Water Pollution Control, Vol 73, No 3, p 277-288, 1974. 3 ref.

Descriptors: *Research and development, *Europe, Project planning, *Water pollution control, International commissions.
Identifiers: European Economic Community.

The types of research and development activity in the environmental field that are likely to develop under the European Economic Community auspices are indicated. A background of information about the role of relevant community institutions, their policy in regard to environmental problems, and their interactions with other international bodies sponsoring research in this sphere are presented. (Sandoski-FIRL)
W74-13292

THE EUROPEAN SCENE,
Emschergenossenschaft and Lippeverband, Essen (West Germany). Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W74-13293

THE INSTITUTE AND EUROPE,
J. R. Simpson.
Water Pollution Control, Vol 73, No 3, p 295-306, 1974.

Descriptors: *Europe, *Water pollution control, International commissions, Project planning.
Identifiers: European Economic Community, *United Kingdom.

Objectives of the Institute of the Water Pollution Control of the United Kingdom are presented in relation to its influence on national and international attitudes and policies. The Institute's position in the European Economic Community also is discussed. (Sandoski-FIRL)
W74-13294

PROGRAM WILL CONTROL POLLUTION FROM WATERCRAFT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W74-13295

WATER ACT 1973 RIVERS (PREVENTION OF POLLUTION) ACT 1951 ATTORNEY GENERAL V. WELLINGBOROUGH UDC.
Water Services, Vol 78, No 939, p 167, May, 1974.

Descriptors: *Legislation, *Regulations, *Local governments, *Judicial decisions, Jurisdiction, Treatment facilities, Sewage disposal.
Identifiers: *United Kingdom(Wellingborough-Eng).

The Court of Appeal recently has heard the first appeal arising out of the transfer of sewage disposal functions under the Water Act 1973. It was an appeal against an injunction granted against the former Wellingborough U.D.C. So as not to lose control of its new facilities, the local authority stepped up on-line construction and service of the facility, a measure which breached section 7 of the Rivers Act 1951 since the effluent would not comply with the consent which had previously been given. Thus the Attorney General requested an injunction against using the new sewage disposal works until such time as it had been completed effectively. The Court of Appeal dismissed the appeal by the Wellingborough U.D.C. against this injunction and also decided that it was not excusable for the local council to pour effluent from its uncompleted works into the river. (Sandoski-FIRL)
W74-13296

THE BIODEGRADATION OF HYDROCARBONS,
For primary bibliographic entry see Field 5B.
W74-13300

SOME INVESTIGATIONS CONCERNING UPVC WATER AND SEWER PIPES AND FITTINGS,
Vattenbyggnadsbyran Ltd., Stockholm (Sweden).
For primary bibliographic entry see Field 8A.
W74-13313

MEETING THE NPDES DEADLINE: DOES CLOSE ONLY COUNT IN HORSESHOES.
J. T. Sliter.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1649-1650, July, 1974.

Descriptors: *Legislation, *Discharge(Water), *Permits, Legal aspects, Federal government.
Identifiers: *Envirornmental Protection Agennt.

With nearly 45,000 applications now on file, it will be impossible for the Environmental Protection Agency and/or the 15 states administering their own programs to issue the National Pollution Discharge Elimination System (NPDES) permits to all discharges by the required congressionally-imposed deadline date of December 31, 1974. EPA announced that the agency hopes to issue permits to all major dischargers and to a substantial number of minor ones by the end of the calender year. Epa has called for legislative relief from this and other impending deadlines with a change in the permit deadline to July 1, 1974. It is thought that the focus of attention regarding permits may shift from attempts to obtain them to the issue of enforcing them by January 1975. Methods of enforcement for noncompliance include jail sentences for company officials as well as enforcement orders and civil actions in district courts. (Sandoski-FIRL0
W74-13314

WATER QUALITY CONSIDERATIONS IN PLANNING SMALL WATERSHEDS,
Soil Conservation Service, Jackson, Miss.
J. P. Burt, and R. E. Gentry.
Journal of Soil and Water Conservation, Vol 39, No 3, p 133-135, May/June, 1974. 3 tab, 2 ref.

Descriptors: *Water quality control, *Water quality standards, *Water supply, *Field studies, Conservation, Temperature, Dissolved oxygen, Dissolved solids, Odors, Chemicals, Public health, Streams, Lakes, Drainage areas, *Mississippi, *Small watersheds.

State water quality criteria in Mississippi are summarized for water supply and water-contact sports. Factors listed are dissolved oxygen, pH, temperature, bacteria, chlorides, specific onductance, dissolved solids, threshold odor, phenolic compounds, and certain chemicals. Criteria are listed in order to protect a participant's health in water sports and to provide a safe and appealing body of water. Field reconnaissance of a darinage area and water analyses of its streams were used to estimate the quality of water in the planned lakes. (Prague-FIRL)
W74-13319

EFFLUENT CHARGES-A PRICE ON POLLUTION,
Pennsylvania State Univ., University Park. Center for Air Environment Studies.
T. A. Ferrar, and R. L. Horst.
Atmospheric Environment, Vol 6, No 6, p 657-667, June 1974. 6 ref.

Descriptors: *Effluents, Pollution, Economics, *Pollution taxes(Charges).
Identifiers: *Effluent charge, National tax policy.

The concept of putting a price on pollution has been proposed as a means of inducing control of environmental deterioration. The non-economist reader is presented with theoretical advantages offered by an effluent charge strategy by reviewing some of the arguments presented by economists for the adoption of a national tax policy. Effluent chge is briefly discussed. Analysis focuses on the question of efficient allocation of resources in an idealized, perfectly competitive economy with subsequent generalization to imperfect markets. Examined also is the least-cost to society attribute of an effluent charge scheme. (Leibowitz-FIRL)
W74-13320

WATER QUALITY PROBLEMS ARISING FROM IRRIGATION RETURN FLOW,
Bengal Engineering Coll., Howrah (India). Dept. of Civil Engineering.
D. K. Ghosh.
Journal of the Institution of Engineers (India), Vol 54, Part PH2, p 55-56, February, 1974. 5 ref.

Descriptors: *Water quality control, *Management, *Irrigation, Agriculture, Management, Research, *Return flow.

Major water quality problems arise from irrigation return flows. Their solutions, the control measures required, and necessary research activities have been indicated. Quality of the residual water draining from irrigated areas as return flow may be materially degraded in several ways, as compared with the initial water supplied. Irrigated agriculture consumes the largest quantity of water, and it will be of great significance in the overall water management and development in a basin. This is particularly so when water resources are fully utilized. Measures for controlling water quality degradation by irrigation return flows are urgently required. (Prague-FIRL)
W74-13322

COMPUTERIZED REPORTS IMPROVE SEWER MAINTENANCE,
W. S. Van Natta.
The American City, Vol 89, No 6, p 81-83, June, 1974. 2 fig.

Descriptors: *Sewerage, *Costs, *Municipal wastes, Statistics, Sewer systems, Maintenance.
Identifiers: Records.

Accurate and accessible records are essential in the efficient operation of sewers, and in the inexpensive operation of the same. Information is needed on each separate length of sewer in the city's system, and the development of the sorts of records most helpful to those needing the information. A statistical record evaluating the efficiency and progress of overall maintenance is required for administrators and engineers, and a detailed record which would reflect each individual maintenance action and the expense to that individual portion sewer system is necessary. (Leibowitz-FIRL)
W74-13339

POLLUTION CONTROL: THE RELATION OF WATER QUALITY PROTECTION TO EXPLORATION FOR AND PRODUCTION OF OIL AND GAS IN THE SOUTHWEST,
Texas Water Commission, Austin.
J. J. Vandertulip.
In: Oil and Water - A Symposium, Bureau of Economic Geology, Texas University, Austin, January 29, 1965. p 33-39 (1965).

Descriptors: *Groundwater, Water pollution, *Oil industry, Saline water, Statutes, Laws, *Brines, Wells, Natural gas, Water quality, Water quality control, Legal aspects, Economics, *Southwest US.
Identifiers: Texas Water Pollution Control Board, *Texas Water Commission, Salt water disposal, Brine pollution control, Subsurface disposal.

Brine pollution of water is not a new nor simple problem. The following points appear important in an objective appraisal of the situation: (1) Oil and gas production continues to increase, and salt water production goes up as an unavoidable corollary. Salt water production in Texas was reported at approximately 21/4 billion barrels in 1961. (2) Brine pollution of ground and surface water can and has resulted from improper or imprudent practices of exploration, well completion, salt water disposal, and well abandonment. (3) Brine pollution control must be based upon effective enforcement authority, sound petroleum engineering techniques, and competent evaluations of ground and surface water hydrology. (4) Texas uses approximately 15 million acre-feet of water each year for consumptive purposes, of which 70 percent is supplied by ground-water aquifers. Oil and gas fields coexist throughout the state with the areas underlain by the major aquifers. Ineffective water protection programs in these areas is a particular threat to water quality and conservation. (5) While simplification of governmental pollution control is desirable, it is apparent that brine pollution is a problem involving the immediate responsibilities of the oil and gas administrative agencies and the water planning agencies of individual states. (Campbell-NWWA)
W74-13342

ENVIRONMENTAL PROTECTION-ATTEMPT AT A CRITICAL OBSERVATION, (IN GERMAN),
Graz Univ. (Austria). Hygiene-Institut.
J. R. Moese.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med, Vol 157, No 2/3, p 95-101, 1973.
Identifiers: *Noise, Powersaw, *Detergents, Snowmobile, Aircraft, *Water pollution control, *Air pollution.

Specific pollution problems, such as the use of gasoline instead of electrically operated lawn mowers and power saws, snowmobiles, noisy construction equipment and aircraft are some of the common aspects of everyday life which should be controlled. Clear water should be conserved, detergents used sparingly and the washing of automobiles and oil changing near bodies of freshwater should be prohibited. Air pollution caused by heating units and gasoline motors and waste pollution as well as optimum utilization of space are also discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-13357

SANITARY EVALUATION OF WATER QUALITY IN THE INITIAL OPERATING PHASE OF THE VYACHESLAV RESERVOIR, (IN RUSSIAN),
Meditsinskii Institut, Tselinograd (USSR).
For primary bibliographic entry see Field 5B.
W74-13364

CONTRIBUTION TO THE MOSQUITO FAUNA (DIPTERA, CULICIDAE) OF THE LANDSCAPES BETWEEN THE HIGH PLAINS OF THE LOWER HARZ MOUNTAIN, THE LOWER VALLEY OF THE UNSTRUT AND THE MID ELBE RIVER SECTION: 4. RESULTS OF PHYSICAL-CHEMICAL ANALYSIS OF LARVAL BREEDING WATERS OF THE GENUS AEDES MEIGEN 1818,
V. Dix.
Hercynia Fachgeb Bot Geogr Geol Palaeontol Zool, Vol 9, No 1, p 69-74, 1972, Illus.
Identifiers: Aedes, Culicidae, Diptera, Fauna, Larvae, *Mosquitoes, Germany(Halle).

Physico-chemical analysis of larval breeding waters at the genus Aedes in the district of Halle (East Germany) are reported. The factors examined included pH, Cl content KMnO4 consumption, electrolytic conductivity, alkalinity and hardness. The latter 2 are insignificant as ecologically limiting factors, and pH and saline content have the greatest significance.--Copyright 1973, Biological Abstracts, Inc.
W74-13386

WATER POLLUTION ASPECTS OF STREET CONTAMINANTS,
Illinois State Univ., Normal. Coll. of Applied Science and Technology.
For primary bibliographic entry see Field 5B.
W74-13411

INDUSTRIAL WASTE EFFLUENT MONITORING,
For primary bibliographic entry see Field 5A.
W74-13422

WATER QUANTITY AND QUALITY MANAGEMENT IN THE RUHR VALLEY,
Ruhrverband und Ruhrtalsperrenverein, Essen (West Germany).
K. R. Imhoff.

Descriptors: *Water management(Applied), *Water quality, *Water supply, *Water pollution control, *Europe, *Organizations, *Administrative agencies, Foreign countries, Waste water treatment, Oil pollution, Water reuse, Costs, Research and development, Industrial water, Industrial wastes, Human population.
Identifiers: *Germany(Ruhr Valley).

Because of the concentration of coal, industry, and population in the Ruhr Valley of Germany, special measures had to be taken to guarantee water supply and waste water disposal. Water quantity and quality are managed by strong water associations responsible for drainage areas. The roles of these associations in waste water treatment, prevention of oil pollution, water reuse, costs, and research are discussed, as well as the part which each of these areas plays in the overall control of water quantity and quality. (Witt-IPC)
W74-13424

RATIONAL ORGANIZATION OF WATER CONSUMPTION IN THE WOOD PREPARATION ROOM OF PULP AND PAPER MILLS (ORGANIZATSIYA RATSIONAL'NOGO VODOPOL'ZOVANIYA V DREVESNOPODGOTOVITEL'NYKH TSEKHAKH TSELLYULOZNO-BUMAZHNYKH PREDPRIYATII),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR).
For primary bibliographic entry see Field 3E.
W74-13426

HOW TO CURTAIL OR END DISCHARGES OF SEWAGE FROM SHIPS.
Marine Engineering/Log, No 5, p 34-37, 119, May 1974.

Descriptors: *Sea water, *Boating, *Regulations, *Water pollution control, Sewage treatment, Treatment facilities, Equipment, Capital costs, Boats, United States, Discharge, Maintenance costs.
Identifiers: *Marine Sanitation Devices(MSD's).

Prevention of discharging untreated sewage from vessels in marine waters is becoming increasing apparent not only in the United States, but on an international level. Due to existing and proposed regulations, ship operators must install marine sanitation devices (MSD's) costing about $25,000 to $80,000, in addition to installation and maintenance costs. Various types of MSD's and discharge systems as well as selection factors are discussed in relation to United States regulations. (Sandoski-FIRL)
W74-13436

DOUBLE-BOTTOM BARGES PROVIDE GREATER PROTECTION AGAINST WATER POLLUTION.
Marine Engineering/Log, No 5, p 42-43, May 1974.

Descriptors: *Barges, *Transportation, *Water pollution control, Construction materials, Oil spills, Costs, Inland waterways.
Identifiers: Petroleum products.

The Dravo Corporation has designed and built double-skin integrated tank barges used for the

transportation of petroleum products. From a fuel utilization standpoint, transportation by towboats and barges is considerably more efficient and economical as compared with river tank shipping, rail service, and truck transport. In double-skin barges, all framing is on the exterior so that tank compartments have smooth, easy-to-clean interior surfaces assuring purity of cargo. Also, double-skin construction provides for greater protection against spillage should the exterior shell of the barge hull be damaged. The upward trend toward the use of double-skin barges for transporting petroleum products is part of the current growth in overall shipping volume on the 25,000 miles of the United States' inland waterways system. (Sandoski-FIRL)
W74-13437

SLOW-RELEASE PESTICIDE SYSTEM: POLYMERS OF LACTIC AND GLYCOLIC ACIDS AS ECOLOGICALLY BENEFICIAL, COST-EFFECTIVE ENCAPSULATING MATERIALS,
Battelle Columbus Labs., Ohio.
R. G. Sinclair.
Environ Sci Technol. Vol 7, No 10, p 955-956. 1973 Illus.

Descriptors: *Pesticides, *Herbicides, Agricultural runoff, Pollutants, Water pollution sources, Chemical wastes, Polymers, Plastics, *Water pollution control.
Identifiers: Glycolic-acid, Lactic-acid, Thermoplastics, Copolymers, Slow-release agents.

Thermoplastic polymers and copolymers of glycolic and lactic acid are employed as the slow-release encapsulating agent. These polymers degrade to natural materials that are harmless to the environment and, in doing so, slowly release encapsulated herbicides or pesticides. The total polymer and pesticide package is easy to fabricate and offers the potential of effectively controlling the runoff or agricultural chemicals into streams while maintaining an effective dose.--Copyright 1974, Biological Abstracts, Inc.
W74-13445

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ENVIRONMENTAL PLANNING METHODS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
D. A. Bella.
In: Coastal Zone Management Problems, seminar conducted by Water Resources Research Institute, Oregon State University, Fall 1973, Corvallis. Report SEMN WR 018-74, January 1974. p 53-60. 10 ref.

Descriptors: *Environmental control, *Coasts, *Regional development, *Planning, Estuaries, Regional analysis, Methodology, Oregon, Management, Conservation, Decision making.
Identifiers: Diversity planning.

The diversity approach, developed in a recent study entitled 'General Planning Methodologies for Oregon's Estuarine Natural Resources,' one of several comprehensive planning methods to organize human activities within estuaries, is critiqued. This approach assumes an uneven distribution of man's environmental influences with development efforts clustered in a number of selected estuarine systems while steps are undertaken to discourage development in others. The basic management unit under the diversity approach is several estuaries. Advantages of this method include reduced large scale environmental changes, preserved environmental options, and a higher quality of life. Estuarine systems in the approach are classified according to the conservation or development envisioned for each and distinguished by the kinds and degree of irreversibility of commercial, industrial, residential, and recreational activity permitted. The placing any system into one of the three classes does not imply the abandonment of sound environmental practices--the best methods should be utilized to minimize adverse impacts. A number of mechanisms including zoning, land use, legislation, and conditions attached to federal funding, may be utilized to encourage the clustering and other patterns suggested by the diversity approach. (See also W74-12756) (Schroeder-Wisconsin)
W74-12762

WATER RESOURCES DISTRIBUTION OPTIMIZING,
For primary bibliographic entry see Field 6D.
W74-12783

A SELECTED ANNOTATED BIBLIOGRAPHY ON LAND RESOURCE INVENTORY AND ANALYSIS FOR PLANNING,
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
E. B. MacDougall, and C. E. Brandes.
Pennsylvania Dept. of Environmental Resources, Harrisburg, February 1974. 41 p.

Descriptors: *Land use, *Natural resources, *Planning, *Methodology, Bibliographies, Land management, Decision making, Land resources, Soils, Climatology, Hydrology, Limnology, Evaluation, Computer programs, Vegetation, Wildlife, Aesthetics, Geology, Census.

An annotated bibliography covering environmental planning material concerned with land resource inventories and planning analyses tools is presented. The material consists of selected articles, reports and books published in the U.S. and Canada during the 1960-1973 period. Articles are categorized under natural sciences and planning composed of work by scientists relevant to planning decisions; methods of land resource inventory and analysis for planning; prototypical environmental planning studies; examples of land resource inventories for planning; an evaluation of scenic quality; an information systems section; an environmental plan incorporating land resources analysis components; a series of review criticisms and commentaries of published environmental planners; and a bibliography concerned with natural resources science literature relevant to planning. Over 259 annotated bibliographies are provided. (Schroeder-Wisconsin)
W74-12795

ECONOMIC ASPECTS OF THE SYSTEMS APPROACH TO WATER MANAGEMENT,
A. A. Beschinskiy, and A. Sh. Reznikovskiy.
Soviet Hydrology: Selected Papers, No 1, p 15-25, 1973. 10 ref. Translated from Water Resources (Vodnyye resursy) No 1, p 21-35, 1973.

Descriptors: *Water management(Applied), *Systems analysis, *Water utilization, *Economics, *Operation and maintenance, Comprehensive planning, Control, Simulation analysis, Optimization, Costs, Capital, Investments, Regional development, Hydrology, Projects.
Identifiers: *USSR, Economic effectiveness.

Water management in the USSR has entered a phase of complex and multiple-systems control, covering large areas, having complex internal and external relations--systems which are both dynamic and stochastic. The diversified controlling elements of the systems have essentially different technical and economic characteristics and a complex topology. Existing methods for planning and operating system elements are not always effective. A comprehensive systems analysis is required, water resources must be accounted for when drawing an inter-industry balance, and mathematical models developed in recent years must be used. Needed are the aid of modern computer technology and the maximum mechanization and automation of planning, project designing, and exploitation. The broad range of methodological technical-economic problems facing water management includes: statistical simulation of random processes for planning and operation (i.e., river runoff, evaporation, etc.); optimization of capital investments in water management and selection of the optimum parameters of its individual elements; optimization of the operating conditions of systems and control of their exploitation, including automatic control; and economic estimates, comparisons, and optimization criteria. Solution of these and other problems facing water management requires extensive scientific investigation; means and methods of performing these investigations are examined. (Bell-Cornell)
W74-13017

PLANNING METHODOLOGY FOR THE DESIGN OF REGIONAL WASTE WATER TREATMENT SYSTEMS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W74-13018

LINEAR DECISION RULE: A NOTE ON CONTROL VOLUME BEING CONSTANT,
Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 4A.
W74-13019

INDUSTRIAL ECONOMIC MODEL OF WATER USE AND WASTE TREATMENT FOR AMMONIA,
Houston Univ., Tex.
For primary bibliographic entry see Field 5D.
W74-13020

MULTIOBJECTIVES IN WATER RESOURCE SYSTEMS ANALYSIS: THE SURROGATE WORTH TRADE OFF METHOD,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
Y. Y. Haimes, and W. A. Hall.
Water Resources Research, Vol 10, No 4, p 615-624, August, 1974. 4 fig, 1 tab, 36 ref.

Descriptors: *Water resources, *Multiple-purpose projects, *Decision making, *Optimization, Methodology, Economics, Constraints, Equations, Dams, Reservoir storage, Planning, Mathematical models, Systems analysis.
Identifiers: *Surrogate worth trade off method, Multiple regression analysis, Net benefits.

Water resource projects are generally constructed to serve multiobjectives, due to the nature of the economic factors of large-scale projects such as reservoirs, dams, aqueducts, and the development of groundwater systems. This makes the application of classical optimization methodologies quite difficult. The problem of noncommensurable multiobjective functions in water resource systems is considered. Potential strategies in multiobjective decision theory are summarized, noting that fundamentally decision processes utilize a logical argument to eliminate large numbers of alternatives from further contention for the 'best' decision. A new technique, the surrogate worth trade off method, which allows the quantitative consideration of noncommensurable multiobjective functions is presented. Procedures for the derivation of the trade off functions and the surrogate worth functions are developed and analyzed. Major characteristics and advantages of the method are summarized. In particular, the trade off and surrogate worth functions are constructed in the func-

tional space, where an interaction with the decision maker takes place; only then are these functions transformed into the decision space. The Reid and Vemuri multiobjective problem in water resources, successfully solved via this method, has been chosen as an example. (Bell-Cornell)
W74-13023

THE APPLICATION OF STATISTICAL TECHNIQUES TO RIVER QUALITY MANAGEMENT,
EASAMS, Camberley (England).
For primary bibliographic entry see Field 5A.
W74-13024

OPTIMIZED DESIGN OF A SUBSURFACE DRAINAGE SYSTEM,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W74-13025

DYNAMIC ANALYSIS AND OPTIMAL FEEDBACK CONTROL SYNTHESIS APPLIED TO BIOLOGICAL WASTE TREATMENT,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-13026

SOME PROBLEMS ON THE STOCHASTIC FLOOD CONTROL,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W74-13029

A STUDY OF HOW WATER QUALITY FACTORS CAN BE INCORPORATED INTO WATER SUPPLY ANALYSIS,
Ernst and Ernst, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-13030

DECISION MAKING UNDER UNCERTAINTY: ECONOMIC EVALUATION OF STREAMFLOW FORECASTS,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 4A.
W74-13044

ECONOMICS AND ECONOMISTS IN WATER RESOURCE DEVELOPMENT,
Wisconsin Univ., Madison. School of Natural Resources.
For primary bibliographic entry see Field 6B.
W74-13061

DESERT ECOSYSTEMS: ENVIRONMENT AND PRODUCERS,
Hebrew Univ., Jersualem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 2A.
W74-13150

THE CONFLICT BETWEEN CONSUMPTION AND POLLUTION,
Stanford Univ., Calif.
For primary bibliographic entry see Field 5G.
W74-13236

6B. Evaluation Process

A SOCIO-ECONOMIC EVALUATION OF USERS OF A WATER-BASED URBAN TOURIST ATTRACTION: SAN ANTONIO, TEXAS,
Texas A and M Univ., College Station. Dept. of Agricultural Economics.
R. D. Lacewell, W. L. Trock, and R. Whorton.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 304, $3.25 in paper copy, $2.25 in microfiche. Texas Agricultural Experiment Station Paper 10929, February 1974. 15 p, 7 ref. OWRT B-102-TEX(2).

Descriptors: *Tourism, *Water resources development, *Cities, Economic justification, Planning, Regional economics, Texas, Evaluation.
Identifiers: *San Antonio(Texas), San Antonio River(Texas), Paseo del Rio(Texas).

Since 1960 the Paseo del Rio, a highly developed portion of the San Antonio River which meanders through downtown San Antonio has become a major tourist attraction. Business establishments in the area have grown to over 30 and promotional activities for the area are growing. A personal interview survey was conducted during 1971-72 to aid local decision makers in evaluating several suggested extensions of the Paseo del Rio. Users were randomly sampled during each season with sampling per season conducted for one week. Socioeconomic characteristics including age, race, education, occupation, level of expenditures, distance traveled, and preferences were collected in 3,347 interviews. To estimate the relationship among selective user characteristics and level of expenditures, regression analysis was used. Results indicated 28%, 33%, 18% and 14% of the users utilized the river taxi--a water tour--in the spring, summer, fall and winter, respectively. Individuals most frequently interviewed were male, about 30, a professional, businessman, student, or serviceman, and a San Antonio resident with an average income of $9,000. Expenditures of the typical user group were $5.50, primarily on food and sightseeing. Nearly 1 million people visited the area duing the study period, expending $2 million. (Schroeder-Wisconsin)
W74-12755

A LOOK AT THE COASTAL ZONE,
Oregon State Univ., Corvallis. Sea Grant College Program.
W. Q. Wick.
In: Coastal Zone Management Problems, seminar conducted by Water Resources Research Institute, Oregon State University, Fall 1973, Corvallis. Report SEMN WR 018-74, January 1974, p 1-4.

Descriptors: *Coasts, *Management, Oregon, Environment, Comprehensive planning, Coordination.
Identifiers: Coastal zone.

The coastal zone represents an interface between the earth's three domains--land, sea and atmosphere. While coastal zones are diverse they share a number of common processes: mixing of fresh and salt water, transport of land sediment, and buffeting by the wind and tides. Abundant resources, mild climate, natural beauty, and the opportunity to make a living have placed increased demands on the zone's resources. The continental shelves and nearby water, for example, represent only 5% of the earth's surface area and yet nearly two-thirds of the human population lives near the coasts. World-wide, coastal zones are being destroyed by a number of human-related factors including chemical wastes, dumping, increased sedimentation and coastal water structures. Such factors can destroy the coastal zone unless comprehensive planning is achieved. For Oregon, an increased number of tools to aid coastal citizens in the planning process are being developed. Planning, however, requires compromises but 'proper compromises' can establish harmony. (See also W74-12756) (Schroeder-Wisconsin)
W74-12757

OPERATIONS OF THE COASTAL COMMISSION,
Oregon Coastal Conservation and Development Commission, Florence.
W. E. Ternyik.
In: Coastal Zone Management Problems, seminar conducted by Water Resources Research Institute, Oregon State University, Fall 1973, Corvallis. Report SEMN WR 018-74, January 1974, p 5-19.

Descriptors: *Coasts, *Comprehensive planning, *Management, Regional development, Resource development, Decision making, Coordination, Planning, Estuaries, Natural resources, Economics, Conservation, Environment, Standards, Legislation, Social participation, Mapping, Transportation, Data storage and retrieval, Institutions, Oregon.
Identifiers: *Coastal zone, *Problem areas.

The Oregon Coastal Conservation and Development Commission (OCCDC) was created in 1971 to prepare and recommend plans and implementation approaches for the wise management of the natural resources in the coastal zone; and to submit a final report for legislative action by 1975. An interim report of OCCDC activities is given. OCCDC has outlined a series of resource problems and critical resource concerns and identified 18 natural categories including estuaries, wetlands, beaches, unique scenic features, the continental shelf, wildlife and fish habitats, alternative land use areas, and aesthetics, which are of critical environmental concern. Problems identified for the coastal zone include the lack of comprehensive inventory of its unique and fragile features, unbridled and poorly conceived development, increased population pressure, visual pollution, uncontrolled harvesting of coastal resources, limited financial resources to support required public services, and lack of transportation planning. Approaches to examine each of the problems include surveys and analysis of the coastal economic sectors, coordinated transportation planning, mapping programs, data storage and retrieval programs, and guidelines for development programs to aid local units in planning estuarine areas are presently underway or are being developed. (See also W74-12756) (Schroeder-Wisconsin)
W74-12758

PROPERTY OWNER ATTITUDES AND PERCEPTIONS,
Oregon State Highway Div., Salem. Environmental Section.
J. A. Zinn.
In: Coastal Zone Management Problems, seminar conducted by Water Resources Research Institute, Oregon State University, Fall 1973, Corvallis. Report SEMN WR 018-74, January 1974, p 29-37. 4 tab, 1 ref.

Descriptors: *Estuaries, *Regional development, *Social values, *Attitudes, Oregon, Regional analysis.
Identifiers: *Siletz Bay(Ore).

Local perceptions of use patterns and development potential were surveyed for Siletz Bay, a small estuary along the central Oregon coast. Three communities surround the bay: a vacation development--Salishan; Taft--a service center for the region, and Kernville and Cutler City--two small economically depressed villages. Information was acquired through questionnaires, soliciting 146 or 23% of the households in the area. Collected data was analyzed using six socioeconomic variables: age, length of property ownership, temporary or permanent residency, commercial or private property ownership, community of re-

sidence, and family income, to ascertain trends in response patterns. Generally residents living in the bay the longest used it the least. Commercial respondents were the most active users of the bay and perceived its greatest use. Much of the conflict generated around the bay centers on conservation or preservation of the estuary versus development to foster economic return. Only 31% of respondents felt there should be no major modification--61% of temporary and 22% of the permanent residents. Typically, wealthier, average age, temporary residents favored conservation. Younger or older permanent residents of the third community tended to favor development. (See also W74-12756) (Schroeder-Wisconsin)
W74-12760

THE COAST AS SEEN BY THE CORPS OF ENGINEERS,
Corps of Engineers, Portland, Oreg. North Pacific Univ.
A. R. Marshall.
In: Coastal Zone Management Problems, seminar conducted by Water Resources Research Institute, Oregon State University, Fall 1973, Corvallis. Report SEMN WR-018-74, January 1974, p 61-67.

Descriptors: *Coasts, *Coastal engineering, *Federal government, Regional development, Management, Water resources development, Oregon.
Identifiers: *Corps of Engineers.

A brief historical overview and the growing scope of the Corps of Engineers in coastal zone management problems is presented. The Army Corps of Engineers dates from the Battle of Bunker Hill when Richard Gridley was appointed chief engineer to plan and dig a trench system against the expected British attack. Included in their past activities are levee work, nationwide flood control systems, and assistance in development and maintenance of harbors, canals, and navigable rivers. The general problem of the coastal zone as perceived by the Corps is one of supply and demand--how to reconcile the current and projected needs of the people with the limited supply of shoreline resources in a socially, environmentally, and economically acceptable way. Programs utilized to achieve this objective are navigation projects, permits, coastal protection projects, the national shore and erosion study, the Coastal Engineering Research Center, beach erosion projects, and flood plain information studies. Along the Oregon coast, currently the Corps is building jetties, conducted dredging and studying requests for other jetty construction. All their work is documented by Environmental Impact Statements. Public involvement is emphasized in the planning stages and all work is coordinated with all other interested agencies and citizens. (See also W74-12756) (Schroeder-Wisconsin)
W74-12763

SOUTH CAROLINA'S NEW MARINE RESOURCES CENTER,
South Carolina Wildlife Resources Dept., Charleston. Marine Research Lab.
For primary bibliographic entry see Field 2L.
W74-12775

GROWTH AND QUALITY--TECHNOLOGY'S DILEMMA. 2. ECOLOGY AND GROWTH--THE TRAGIC INSIGHT,
California Univ., Santa Barbara.
G. Hardin.
Research Management, Vol 16, No 6, p 9-12, 1973.

Descriptors: *Ecology, *Costs, *Decision making, *Ethics, Natural resources, Planning, Welfare(Economics), Social impact, Social values, Environment.

Essential to the understanding of the current ecological crisis is a keen awareness of the concept of tragedy. Not tragedy in the sense commonly used but in the ancient and technical sense. Whitehead's explanation of the technical meaning of tragedy suggests the remorseless working of things; the inevitableness of destiny. Destiny, of course, has not been a palatable concept among Americans. Partially this has been the result of progress--the concept that there is no limit to man's accomplishment, and the ability to avoid assessment of the total cost through the use of externalities. Often economists become entagled in this illusion building their theories on the theory of 'cowboy economics' as Boulding described it, based on the philosophy of 'use it, throw it away, and move to a new frontier; don't pay the costs there's always more out there.' Such an approach has been slow to change, but gradual inroads into the tragic insight have accured Forrester's 'Limits to Growth' and growing economic models assessing the tradeoffs between environmental and economic impacts illustrate the changing philosophy. But such recognition does not come quickly nor is it certain to continue unless the sense of inevitability is better understood. (Schroeder-Wisconsin)
W74-12778

ECONOMIC APPRAISAL OF MICHIGAN'S SPORT FISHERY, JANUARY 1 - APRIL 24,
Michigan Dept. of Natural Resources, Lansing.
P. V. Ellefson, and G. C. Jamsen.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-73-11018, $4.00 in paper copy, $2.25 in microfiche. Research and Development Report No 227, March 1971. 37 p, 18 fig, 15 tab.

Descriptors: *Evaluation, *Economic impact, *Michigan, *Sport fishing, Fish management, Salmon, Trout, Recreation demand, Lake Michigan, Value engineering, Benefits, Psychological aspects.

In order to develop a management plan for Michigan's sport fisheries an analysis was undertaken of the recreational demand characteristics of the salmon and steelhead trout fishermen (SS) and the other fishermen (OF). The determination of the recreationalists' valuation of the fishery depends on demand analysis, based on a demand curve for the total recreational experience--anticipation, planning, traveling from and to the site, activity at the site, and recollections. Next, a separate demand curve for only the fishing experience is determined. Finally, the total value of the resource to the fisherman is developed by summing the area under the demand curve--total willingness to pay. The valuation process was applied to statewide SS activities and then to SS activities in Lake Michigan and its tributaries. Results indicate that for the four months surveyed $587,600 and $237,400, respectively, of recreational value accrued; for OF, statewide, this value was $51 million. The importance of a number of variables to SS and OF angler days was also determined through multiple regression of fish available, accomodations, and fishing cost, and were found significant for SS while only the relationship between angler days and catch for OF. Characteristics of fishermen are also summarized. (Schroeder-Wisconsin)
W74-12779

ECONOMIC GROWTH AND THE GENERATION OF WATERBORNE WASTES,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 5B.
W74-12782

MORMON LAKE,
Arizona Academy of Science, Tempe.
E. L. Smith, and G. L. Bender.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-225 246 $3.25 in paper copy, $2.25 in microfiche. Report No OEPAD-EP-73-31, 1 June 1973. 17 p, 5 append. HUD CPA-AZ-09-16-1008.

Descriptors: *Lakes, *Conservation, Wildlife conservation, Arizona, Preservation, Recreation, Education, Wildlife habitats, Systematics.
Identifiers: *Mormon Lake(Ariz).

Justifications for the proposal that Mormon Lake, Arizona be established as a senic and recreational natural area are presented. The lake, bordered on the west by Mormon Mountain and on the east by Anderson Mesa, represents the state's largest natural lake when full. The lake's water level depends entirely on precipitation in the surrounding watershed with the result that it has dried up completely in the summers of 1947, 1956 and 1972. The surrounding area is a typical transition life-zone habitat. Ponderosa pine is generally the dominant species except on the lake's east side where a more unique deciduous flora exists. Establishment of the site as a natural area would provide pretection for the unusual flora assemblages and where community succession, plant-soil, plant-climate and plant-plant relationships can be studied. The fauna is not highly unique except for a certain shrew species rarely found else where in the state. The area has had a long history of disturbances. At present Mormon Lake is a popular recreation area, providing water sports and camping opportunities. Designation of Mormon Lake as a natural area should conserve and enhance its recreational, scenic, and educational value in the future. (Schroeder-Wisconsin)
W74-12784

BENEFIT COST ANALYSIS OF ALTERNATIVE EXPANSION SITES FOR THE VIRGINIA KEY SEWAGE TREATMENT PLANT,
Miami Univ., Fla. Sea Grant Program.
For primary bibliographic entry see Field 5D.
W74-12785

INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION: AN APPLICATION OF A MULTISTATE SEQUENTIAL DECISION MODEL,
Haile Selassie I Univ., Alem Maya (Ethiopia).
S. E. Bekure, and V. R. Eidman.
Southern Journal of Agricultural Economics, Vol 3, No 1, p 155-160, 1971. 1 tab, 9 ref.

Descriptors: *Net income, *Groundwater resources, *Decision making, Linear programming, Groundwater recharge, Dynamic programming, Optimum development plans, Great Plains, Water supply, Water utilization, Irrigated land, Projections.
Identifiers: Central Ogallala Formation, Multistage decision model.

The Central Ogallala Formation located between the Arkansas River and the Southern Canadian River provides large volumes of groundwater for irrigation, industries and municipal use. Given the growing water demand and relative low recharge rate overdrafts of the aquifer have been increasing (0.11 million acre feet in 1954 to 2.7 million in 1964). To determine the optimum intertemporal allocation of this groundwater resource a multistage sequential decision model was developed. The model consists of a series of stages joined such that the output of one stage becomes the input of the other. A typical stage contains five components: an input stage, an output state, a decision variable, a stage return and a stage transformation. The model assumes a 100 year planning horizon and interest rates of 0, 4, and 8%. Input data required includes quantity of groundwater in storage, and the net returns that accrue to each alternative withdrawal rate in each groundwater state. Results of this approach are compared to

withdrawal levels generated by a recursive linear programming model which assumes that individual irrigators pose pumping decisions on their own shortrun returns. Results indicate that the optimal withdrawal decision is not sensitive to a shift from a 4 to 8% discount rate. (Schroeder-Wisconsin)
W74-12787

AQUACULTURE IN ALASKA.
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5E.
W74-12791

SOCIOECONOMIC IMPACTS OF THE FEDERAL RECLAMATION PROGRAM IN THE UNITED STATES,
Bureau of Reclamation, Washington, D.C. Economics and Statistics Branch.
A. D. Nielsen, and L. D. Walker.
Report (undated). 11 p. 9 ref.

Descriptors: *Water resources development, *Federal Reclamation Law, *Income, *Project benefits, Recreation, Capital costs, Economic impact, Regional economics, National income, Investment, Employment, Social aspects, Environmental effects.
Identifiers: Bureau of Reclamation.

Since the creation of the Federal Reclamation program in 1902 a total of $5.5 billion has been invested in over 222 storage reservoirs, 134 diversion dams, 7,612 miles of water carriage facilities, 19,651 lateral miles, 109 pumping plants, 50 power plants, 300 substations, 16,200 circuit miles of transmission lines and 9,861 miles of project drains. Studies of Federal Reclamation projects indicate that sizeable socioeconomic impacts in the U.S. have resulted through the demands arising from construction activities and the recurring social, environmental and economic impacts from project operations. An examination of three reclamation dams and power plants illustrate the pervasiveness of socioeconomic impacts of construction. These projects provided 96 man-years labor--58 representing indirect offsite employment exclusive of multiplier effects, per $1 million of construction costs. Once the structures are completed a steady stream of national, state, and local annual benefits recur. One recent Bureau of Reclamation study indicates increased business activity, personal income and corporate profits of (in million dollars) 4,260.5, 2,645.7 and 499.5, respectively, resulting from federal reclamation projects in fiscal 1971. The socioeconomic impacts of reclamation projects on state and local governments, technological changes and recreational activities, are also discussed. (Schroeder-Wisconsin)
W74-12793

AN ECONOMIC EVALUATION OF IRISH SALMON FISHING. I: THE VISITING ANGLERS,
Economic and Social Research Inst., Dublin (Ireland).
R. O'Connor, and B. J. Whelan.
Paper No 68, February 1973. 66 p. 1 fig, 20 tab, 13 ref, append. A, B.

Descriptors: *Sport fishing, *Economic impact, *Evaluation, *Salmonids, Recreation demand, Fishing, Salmon, Sport fish, Monetary benefits, Income.
Identifiers: *Ireland, Foreign anglers.

In 1970, 3.5 million lbs. of salmon valued at 1.2 million pounds sterling, and 60,650 lbs. of sea trout were caught in the Republic of Ireland by commercial and sport fishermen. The economic impact on Ireland of this growing fish harvest by foreign anglers is assessed. A stratified random sample, picked from the 1970 salmon licenses issued by the 17 administrative fishing districts, was utilized. Variable sampling fractions were applied to ensure sufficient numbers of anglers in each district. Out of 790 postal questionnaires sent out, 430 useable were returned. Economic impacts examined include total expenditures by foreign anglers within each region and the nation. Total expenditures are also expanded utilizing a national multiplier to assess the full value added. Results indicate that 3,800 salmon/sea-trout anglers visited the Irish Republic in 1970. In all, salmon anglers made 14,000 visits, over 8,000 of which were day trips. The survey indicated that salmon angling is primarily a sport of the well-to-do foreign angler and a pastime enjoyed by more elderly people. Total expenditures by foreign salmon anglers in 1970 was estimated at 696,000 pounds sterling and by assuming a national multiplier of 1.6, total value added was estimated at 829,000 pounds sterling. (Schroeder-Wisconsin)
W74-12796

WATER RESOURCE PROBLEMS AND RESEARCH NEEDS OF NEW MEXICO,
New Mexico State Univ., Las Cruces. Water Resources Research Inst.
B. J. Creel.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 279, $4.25 in paper copy, $2.25 in microfiche. Report No 045, July, 1974. 75 p, 2 fig, 5 tab, 31 ref. OWRT A-041-NMEX(1).

Descriptors: *Research priorities, *Project planning, Water resources institute, Planning, Research and development, *New Mexico, *Coordination.
Identifiers: *Priority ranking, *Information dissemination.

There are many water problems in the State of New Mexico, and research of many kinds will be required in order to solve them. The purpose of this study has been to obtain information that will aid in the development of a coordinated program of water resources research in New Mexico. In the field of water resources, a research tradition has not yet fully developed which would allow the communication and research planning necessary between researchers and the water management practitioners that would provide timely, beneficial, and usable information to the potential users. Frequently, potential researchers are not sufficiently aware of the various water problems in enough detail to formulate a research investigation, or they are unaware that a particular problem exists and those experiencing water problems are unaware of the contribution a researcher could make. Researchers and water management practitioners often are unaware of each other's efforts. Solutions to particular problems may have been found, and in some cases may be well known, but are not being applied. This study is an attempt to inventory and rank the problems, indicate the research needs, and aid in the coordination of water resources projects in the State of New Mexico. (Hain-New Mexico State)
W74-12864

DEVELOPMENT OF CRITERIA FOR EVALUATING URBAN RIVER SETTINGS FOR TOURISM-RECREATION USE,
Texas A and M Univ., College Station. Water Resources Inst.
C. A. Gunn, J. W. Hanna, A. J. Parenzin, and F. M. Blumberg.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 290, $4.75 in paper copy, $2.25 in microfiche. Technical Report No 56, June, 1974. 98 p, 66 fig, 5 tab, 39 ref. OWRT A-021-TEX(1). 14-31-0001-3844, 14-31-0001-4044.

Descriptors: *Planning, *Texas, *Recreation, *Cities, Sites, *Motivation, Attitudes, Evaluation.
Identifiers: San Antonio(Tex), *San Antonio River Walk(Tex).

An earlier study, 'Cultural Benefits from Metropolitan River Recreation-San Antonio Prototype,' (see W73-03270) revealed that urban water resources can be successfully developed for tourism and recreation. The San Antonio River Walk is a unique demonstration of a new amalgam different from either parks or tourist business clusters. It draws upon both for success. It shows the synergistic effect of a park/business mix. Because few other cities have created a park/business complex from their downtown water resources, the purpose of this study is the development of criteria through which cities may evaluate their potential for this use. The general guidelines offered will require special adaptation to local conditions. Three phases of investigation are recommended: Preliminary investigation; study of motivating forces, site factors and other influential factors; and planning and implementation. Preliminary Investigation: This step should identify and perceive anew the water resources of downtown. Water resources within a five-minute walking distance of the central business district have the greatest potential for park/business development. Motivating Forces: One or several motivating forces are important in influencing either interest in or actual development of an urban water-oriented park/business complex. Preservation organizations can provide valuable support for such a development if their orientation is conservation and human use rather than strict preservation. Site Factors: The investigation of the site should begin with an analysis of existing development.
W74-12866

ECONOMIC ASPECTS OF THE SYSTEMS APPROACH TO WATER MANAGEMENT,
For primary bibliographic entry see Field 6A.
W74-13017

INDUSTRIAL ECONOMIC MODEL OF WATER USE AND WASTE TREATMENT FOR AMMONIA,
Houston Univ., Tex.
For primary bibliographic entry see Field 5D.
W74-13020

MULTIOBJECTIVES IN WATER RESOURCE SYSTEMS ANALYSIS: THE SURROGATE WORTH TRADE OFF METHOD,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
For primary bibliographic entry see Field 6A.
W74-13023

DECISION MAKING UNDER UNCERTAINTY: ECONOMIC EVALUATION OF STREAMFLOW FORECASTS,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 4A.
W74-13044

A CONCEPTUAL AND EMPIRICAL ANALYSIS OF WATER PRICING IN MISSISSIPPI MUNICIPALITIES,
Mississippi Univ., Oxford. Bureau of Business and Economic Research.
K. W. Hollman, and W. E. Boyet.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 459 $3.75 paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute, Mississippi State. Completion Report, July 1974. 31 p, 3 fig, 2 tab. OWRT A-079-MISS (1).

Descriptors: *Water costs, *Pricing, *Water rates, Management, *Mississippi, *Regression analysis, *Municipal water, Cities, City planning, Benefits, Water allocation(Policy), Decision making.

The project focused on some of the significant economic questions concerning water pricing in Mississippi. The objectives were: (1) to analyze

the characteristics and pricing policies of the water industry in Mississippi cities; (2) to evaluate the pricing policies of these municipalities from an economic viewpoint, and to suggest more desirable rate making alternatives; and (3) to formulate a multiple regression model which would help determine the variables currently affecting water prices in Mississippi municipalities. A subset of 86 water systems in Mississippi was used for data upon which the multiple regression analysis was based. Of the 20 possible determinants of water prices which were initially considered, six proved to be statistically significant. The results show that municipal water pricing methods in Mississippi are highly arbitrary and basically of a non-cost orientation. A few selected but profound changes in the directions outlined in the theory section of the study could lead to a more equitable allocation of water resources and to more social benefits through better water pricing decisions. The information gained from the study should be helpful to municipal water officials in planning and structuring water rates.
W74-13054

MAN AND WATER, THE SOCIAL SCIENCES IN MANAGEMENT OF WATER RESOURCES.
Kentucky Univ., Lexington. Water Resources Inst.
The University Press of Kentucky, Lexington, Kentucky. 1974, 258 p. L. D. James, editor, $10.50. OWRT A-999-KY(1).

Descriptors: *Water resources, *Management, *Decision making, Administration, Economics, *Social aspects.
Identifiers: *Social sciences, Anthropology, Geography, Political science.

This book is designed to help social scientists contribute more effectively to the formulation of water management policy, thus it has relevance to many issues in the application of technology to problems of widespread current concern. Five social scientists, representing the fields of anthropology, economics, geography, political science, and sociology, review the contributions their disciplines have made to water resources management and suggest ways in which such contributions might be extended. The remaining chapters include responses to the five papers by persons familiar with the practical problems of water management and a general assessment of the discussion by the editor. (See also W74-13059 thru W74-13064) (Huffsey-Kentucky)
W74-13058

THE CHALLENGE TO THE SOCIAL SCIENCES,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James.
In: Man and Water, The Social Sciences in Management of Water Resources, ed. by L. D. James, The University Press of Kentucky, Lexington, p 1-33, 1974. 1 tab, 46 ref.

Descriptors: Water resources, *Water resources development, *Management, Water, Economics, Water utilization, Resources, Water policy, Resources development, Comprehensive planning, Multiple purpose projects, Research and development, Social aspects, Planning, Social impact, Social needs, Value, Social function, Social values, Social change.
Identifiers: *Social sciences, Anthropology, Political science, Sociology, Geography.

Water refurces management provides a convenient context for discussing obstacles to teamwork among social scientists, technical experts, and decision-makers. Social scientists must more effectively contribute their expertise in formulating management policy so that management failures may be fewer and successes may be frequent. Water resources management suffers as alternatives are overlooked, consequences are unforeseen, the wishes of the people are misunderstood, formulated policy is ineffectively implemented, or the consequences of installed projects are not recognized. Improving water resources management relates to the general issues of how conscious social change can or should be used to direct the development and adoption of technological innovation and of how to improve the probability that social choices will truly be in the best long-range interest of mankind. Social scientists must develop models to predict differences in effects among alternatives. Better procedures for using available information must also be found. Blending the contributions of technology and the social sciences and incorporating sound theories into practical applications will be required, but the most difficult task may be getting people from diverse backgrounds to work together. (See also W74-13058) (Grden-North Carolina)
W74-13059

ANTHROPOLOGICAL CONTRIBUTIONS TO THE CULTURAL ECOLOGY AND MANAGEMENT OF WATER RESOURCES,
Washington Univ., Saint Louis, Mo. Center for the Biology of Natural Systems.
J. W. Bennett.
In: Man and Water, The Social Sciences in Management of Water Resources, ed. by L. D. James, The University Press of Kentucky, Lexington, p 34-81, 1974. 81 ref.

Descriptors: Water resources, *Water resources development, *Management, *River basins, Water utilization, Water policy, Resources development, Social impact, Social needs, Social function, Social values, Social change, *Environment, Ecology, Resources.
Identifiers: *Anthropology, *Social sciences, Archaeology, Geography, Civilization, Ethnology, Society, Values, Micro-environment, Human ecology, Hydraulic society, Cultural history, Negev, Sinai Peninsula.

Anthropoligists study water resources as a by-product of research on cultural history and human subsistence, not as a topic in its own right. However, anthropological research can contribute to practical applications in resource management and development. Studies of small-scale water development systems associated with contemporary tribal and peasant societies are the most frequently occurring water research. Archaeological studies of areas inundated by large reservoirs have also played an important role in the development of the discipline and have made contributions to the study of man's use of riverine resources and topography. Of greater significance for water resources management are studies on the water utilization and development schemes of prehistoric and proto-historic peoples. Archaeological studies of water shortage systems in Bronze and Iron Ages in the Negev and Sinai Peninsula have been used as models for modern agrarian development schemes in Israel. The anthropologist is often the person most informed about microenvironments and microcultural features affecting natural resource usage. He is, therefore, in an excellent position to advise planners on the geographic, technological, and sociocultural feasibility of proposed changes. Thus, the anthropologist may find a role in exploring relationships among values, technology, and the uses of nature. (See also W74-13058) (North Carolina)
W74-13060

ECONOMICS AND ECONOMISTS IN WATER RESOURCE DEVELOPMENT,
Wisconsin Univ., Madison. School of Natural Resources.
S. C. Smith.
In: Man and Water, The Social Sciences in Management of Water Resources, ed. by L. D. James, The University Press of Kentucky, Lexington, p 82-101, 1974. 12 ref.

Descriptors: *Cost-benefit analysis, *Systems analysis, Water resources, *Water resources development, *Economics, Water utilization, Water policy, Resources development, Research and development, Social impact, Social values, Economic efficiency, Economic feasibility, Economic impact, Economic justification, Economic life, Economic rent, Forecasting, Optimum development plans, Planning, Income distribution, Project planning, Simulation analysis, Input-output analysis, Cost analysis, Cost allocation.
Identifiers: *Social sciences, Quantitative techniques, Holistic approach.

The economist's role in the water resources field includes establishing criteria for evaluating development, for deciding whether development is appropriate, and for deciding which development design is optimum. Their criteria have been only partly successful; the social context has not been adequately assessed, and economic models are rudimentary in simulating the effects of technological and biological relationships. Economists have developed an economic rationale for considering development alternatives; the benefit-cost analysis, which says that national income increases when benefits exceeds costs in a program, has been incorporated into the decision-making process. 'Who should pay and how' has not been as interesting to economists as determining project optimality, formulation, and contribution to the national economy; however, such financial analysis is emerging as a concern for them. Economists have also aided in suggesting organizational arrangements to make water management more responsive to demand patterns. Quantitative techniques of operations research, input-output analyses, and systems analysis have helped solve water management problems. Economists can also develop economic incentives to achieve social objectives and develop systems of water management to respond to demand changes. (See also W74-13058) (Grden-North Carolina)
W74-13061

ROLE OF GEOGRAPHY IN WATER RESOURCES MANAGEMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
G. F. White.
In: Man and Water, The Social Sciences in Management of Water Resources, ed. by L. D. James, The University Press of Kentucky, Lexington, p 102-121, 1974. 47 ref.

Descriptors: Water resources, *Water resources development, *Management, Water utilization, Water policy, Resources development, Social impact, Social value, Environment, Geographical regions, Geohydrologic units, River basin development, River systems, Floods, Flood data, Flood recurrence intervals, Comprehensive planning.
Identifiers: *Geography, *Social sciences, Social systems.

Geographical analysis especially pertinent to river development and water management includes atlas compilation of background data, homologues studies, and regional and historic studies of water management. Geographers can improve resources estimates by refining the mapping of water balance and by delineating hydrological characteristics of terrain and land use. In studying technological variations in water use and disposal, geographers have added knowledge about the location and spread of different management techniques. Some aspects of water management, such as pollution, have been overlooked by geographers, while others, such as floods, have received extensive attention. Geographers have also developed methods for estimating the effects of dams upon wildlife and recreational use, among other studies of social impacts of water management. Perhaps the distinguishing feature of geographers' contributions has been their holistic viewpoint; they can keep a team of researchers from overlooking

important aspects of relationships between natural and social systems in the area to be manipulated by water management. They are also experienced in examining the full range of choice open to society in dealing with water, including engineering projects as well as readjustments in patterns of land use, water use, or social constraints. (See also W74-13058) (Grden-North Carolina)
W74-13062

TOWARD A POLITICAL SCIENCE OF WATER RESOURCES DECISIONS,
Wisconsin Univ., Madison. Dept. of Political Sciences.
H. C. Hart.
In: Man and Water, The Social Sciences in Management of Water Resources, ed. by L. D. James, The University Press of Kentucky, Lexington, p 122-163, 1974. 73 ref.

Descriptors: Water resources, *Water resources development, *Management, *Political aspects, Water policy, Social impact, Social value, Resources development, Political constraints, Administration, Federal government, Governmental interrelations, Institutions, Jurisdiction, State governments, Local governments, Constraints, Institutional constraints, Cost-benefit analysis, *Decision making.
Identifiers: *Political science, *Social sciences, Public policy.

Contributions to water management from political science are not essential because of any distinct methodology; however, political scientists can contribute concepts concerning legitimate power, cleavage and consensus, and ways of seeking collective goals. Political scientists have done some work in this field, but the potential is largely unrealized. Water policy questions captured a larger share of attention from political scientists twenty years ago than they do now, and while political scientists were less prominently studying the politics and government of water in the 1960's, they were not altogether inactive. For example, case studies were written describing and evaluating the performance of federal and state water resource development efforts. However, this was also a period when economists led the field in improving basin-wide planning and investment decisions using cost-benefit analysis. One other reason political scientists have not been fully engaged in water research problems is that contributions to practical decisions and contributions to theories of politics have become separated at a stage when they must depend heavily upon one another. Perhaps the rapidly growing sub-field of public policy, which can link applied and theoretical work, is the key to the problem. (See also W74-13058) (Grden-North Carolina)
W74-13063

RECENT SOCIOLOGICAL CONTRIBUTIONS TO WATER RESOURCES MANAGEMENT AND DEVELOPMENT,
Kentucky Univ., Lexington. Center for Developmental Change.
S. Johnson.
In: Man and Water, The Social Sciences in Management of Water Resources, ed. by L. D. James, The University Press of Kentucky, Lexington, p 164-199, 1974. 62 ref.

Descriptors: Water resources, *Water resources development, *Management, *Social values, Social impact, Social aspects, Social needs, Social change, Social function, Water, Water utilization, Pollution, Water policy, Resources development, Research and development, Social mobility, Urban sociology, Community development, Social adjustment, Social participation, Motivation, Rural sociology, Attitudes.
Identifiers: *Social sciences, *Sociology, Society, Social environment.

Water resources decisions are social in nature and result from the complex interaction of water resource needs, kind of development proposed, types of institutions needed to implement the development, types of communities affected, and the matrices of values, attitudes, and goals of all those involved. Sociologists conduct community studies as their predominant type of water-related research. They can help solve the pollution problem through theoretical study of value bases leading to wasteful water use or to water pollution. Other examples of water programs needing further study by sociologists include community integration in water resources development, the social consequences of solving water problems with innovative technology, effects of knowledge about water projects on attitudes, the conservation movement, and the characteristics associated with resistance to change. The question of professional incentives and rewards for participating in water-related research is touchy; many sociologists are reluctant to enter applied sociology due to sociology's 'fledgling science' status and to a fear that pure science cannot be advanced by practical application. For sociological research on water resources to continue as it should, institutional constraints, such as the reward-and-status system must be altered, and the scientific status of research must be improved. (See also W74-13058) (Grden-North Carolina)
W74-13064

THE IMPACT OF MAN-MADE LAKES ON RESIDENTIAL PROPERTY VALUES: A CASE STUDY AND METHODOLOGICAL EXPLORATION,
Toronto Univ. (Ontario), Dept. of Geography.
J. C. Day, and J. R. Gilpin.
Water Resources Research, Vol 10, No 1, p 37-43, February, 1974. 3 fig, 5 tab, 17 ref.

Descriptors: *Water resources development, *Reservoirs, *Economic justification, *Land use, *Canada, Lakes, Natural resources, Recreation, Aesthetics, Attitudes, Recreation demand, Recreation facilities, Social aspects, Social participation, Regression analysis, Statistical methods, Project planning, Estimated benefits, Land development.
Identifiers: Ontario, *Don River(Ontario), G. Ross Lord Dam(Ontario), Man-made lakes.

Dams, reservoirs, and associated parks are often partially justified on the basis that they will induce increased property values. This assumption is tested using the G. Ross Lord Dam built as an important component of the Don River basin flood control system and the associated 315 acres of parkland on the west branch of the Don River in Toronto. The area surrounding the reservoir had become urbanized by 1972 when dam construction began. A variety of housing, university research centers, a library and an arena have been constructed. Results showed that residents near the damsite did not know about the project proposal when they moved in, did not feel the valley parkland is an important benefit to the area, placed little importance on the proposed parkland and reservoir when making the choice to live in the study area, and did not believe that the reservoir project would cause major changes in residential property values. Most interviewees who did value parkland owned land contiguous to it. Therefore, planning agencies that justify reservoirs on the basis of an intangible land value enhancement should indicate that only a small area adjacent to the lake will be affected. The magnitude of the benefits will be influenced by the size and aesthetic qualities of each particular lake. It is also proposed that similar studies with more elaborate regression models be repeated in 1977 and 1982 to determine if property value changes have occurred since construction; it is obvious that the dam and the park had no effect on residential property values during construction. (Grden-North Carolina)
W74-13066

NEW ENERGY TECHNOLOGY RESEARCH AND DEVELOPMENT: A RATIONALE FOR SETTING PRIORITIES,
California Univ., Livermore. Lawrence Livermore Lab.
C. J. Anderson, and E. Behrin.
Available from NTIS, Springfield, Va. 22161 as UCRL-51589; $3.25/copy, $2.25/microfiche. Report No UCRL-51589, May 15, 1974. 17 p, 4 fig, 6 tab.

Descriptors: *Energy, Technology, Projects, *Research and development, *Fossil fuels, Nuclear energy, Coals, Oil, Oil industry, Oil shales, Secondary recovery(Oil), Natural resources, Gasoline, Gases, Hydraulic engineering, Reactors, Benefit-cost analysis, Costs, *Research priorities.

The United States can no longer continue using energy at its present rate, keep energy prices low, protect the environment, and remain independent of foreign suppliers. The issue of U.S. energy independence has acquired deep significance. Intense research and development are required to replace imported oil with environmentally acceptable equivalents. Those technologies capable of providing significant new energy by 1985 are examined. They deal primarily with increased utilization of fossil resources because only the continued use of fossil fuels can provide the energy required in this period. Long-range energy sources may include breeder reactors, fusion reactors (magnetic confinement and laser fusion), conversion of solar energy to power, bioconversion (plants and bacteria), and low-temperature hydrogen production. In a broader perspective, near-term technologies are meaningful because they can provide adequate time to develop long-range energy technologies. Although near-term technologies should have a higher priority than long-range research in a national program, efforts in both should be increased. (Houser-ORNL)
W74-13123

TECHNICAL AND SOCIAL ASPECTS OF NUCLEAR WASTE DISPOSAL IN WESTERN EUROPE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5D.
W74-13135

NATURAL RESOURCE INVENTORY FOR URBAN PLANNING UTILIZING REMOTE SENSING TECHNIQUES,
Arizona Univ., Tucson. Office of Arid Lands Studies. Office of Arid Lands Studies, Arizona Univ., Tucson.
K. E. Foster, D. F. Mackey, and C. D. Bonham.
OALS Bulletin 3, October, 1972. 14 p, 1 fig, 2 plates, 2 ref. NASA Grant No NGL 03-002-313.

Descriptors: *Remote sensing, *Hydrologic data, *Vegetation mapping, *Ephemeral streams, *Urban mapping, *Soil surveys, *Arizon, Arroyos, Flooding, Channel morphology, Data collections.
Identifiers: Pantano Wash(Ariz).

Remote sensing techniques were used to map existing vegetation, soil and hydrologic conditions along the lower Pantano Wash area of Tucson, Arizona. Information gathered is being used for urban environmental planning in the Pantano Wash area. The basic purpose of the study was to explore the potential of remote sensing techniques as a tool for planners. Hydrologic changes along the wash due to urbanization were evident when photographs over a 35-year period were compared. Vegetation characteristics and their distribution are available in map form. (Mastic-Arizona)
W74-13143

METHODS AND PROBLEMS OF ESTIMATING WATER-QUALITY BENEFITS,
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W74-13219

THE ENVIRONMENT AND WATER-RESOURCE DEVELOPMENT,
National Wildlife Federation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-13221

WATER QUANTITY AND QUALITY MANAGEMENT IN THE RUHR VALLEY,
Ruhrverband und Ruhrtalsperrenverein, Essen (West Germany).
For primary bibliographic entry see Field 5G.
W74-13424

USE OF DRAINAGE PATTERNS AND DENSITIES TO EVALUATE LARGE SCALE LAND AREAS FOR RESOURCE MANAGEMENT,
Minnesota Univ., St. Paul. Dept. of Horticultural Science.
For primary bibliographic entry see Field 4A.
W74-13453

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

MANAGEMENT OF FISHERY RESOURCES FOR OPTIMUM RETURNS. WOULD IT WORK IN THE GULF OF MEXICO,
Rhode Island Univ., Kingston. Law of the Sea Inst.
W. C. Herrington.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gales, Florida, p 33-41.

Descriptors: *Marine fisheries, *Decision making, *Fish management, Regulation, Fish conservation, Wildlife management, International waters, Political aspects, Institutional constraints, International commissions, Law of the Sea, Fish harvest, *Gulf of Mexico.
Identifiers: Common property, Optimum returns.

Within the past half century substantial changes in the marine fishery management objectives have occurred. The concept of maximum sustainable yield formally stated as a management objective at the 1949 Northwest Atlantic Fisheries Convention, has been a widely accepted good in international fishery management. As a practical measure however, it has been successfully implemented only in the North Pacific Halibut, Sockeye Salmon and Inter-America Tropical Tuna Commissions. A second objective--maximum economic yield--has also emerged. During the 1950's economists revealed that substantial world-wide surplus fishing capacity existed which could be reduced through limitation of seasons, fishing days, or restrictions on gear. Implementation of many programs is difficult because of the social, economic, and political implications of managing a common property resource. A third approach reviewed encompasses a mix of biological, social, economic and political considerations. Implicit in this approach are broad decision processes which include a variety of interest group. Such an approach may lead to varying fishery policies between countries hindering uniform international agreement. Many of the problems involved in each of these approaches center on the treatment of the fisheries as a common property. Effect of two proposals--licenses and lease--on achievement of the above objectives is discussed. (Schroeder-Wisconsin)
W74-12766

UNCLE IS MOVING IN,
National Canners Association, Washington, D.C. Fishery Products Committee.
For primary bibliographic entry see Field 6E.
W74-12769

INDUSTRY ACTIVITIES IN RESPONSE TO THE HEAVY METALS PROBLEM IN SEAFOODS,
National Fisheries Inst., Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-12771

THE DESIGN OF AN AQUACULTURE ENTERPRISE,
Foods MultiNational, Inc., Groton, Mass.
For primary bibliographic entry see Field 8I.
W74-12773

THE LOBSTER FISHING INDUSTRY OF MT. PLEASANT, BEQUIA ISLAND, WEST INDIES,
Minnesota Univ., Duluth. Dept. of Geography.
J. E. Adams.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 126-133. 2 fig, 4 tab.

Descriptors: *Marine fisheries, *Water resources development, *Lobsters, Regional development, Fish conservation, Social aspects, Foreign countries, Foreign waters.
Identifiers: *Bequia Island(British West Indies), *British West Indies, Grenadine Islands, Spiny lobster.

The fish industry of the northernmost island of the Grenadine Archipelago is surveyed. The trade-wind swept island hills are useless for agriculture and until 1950 no significant trade ocurred for the spiny lobsters found in the island's coastal waters. In early 1950 Martinique began purchasing a variety of marine products including the spiny lobsters from Bequia fishermen. With Martinique picking up and storing the product, lobster fishing in Mt. Pleasant was generally on a small scale often consisting of one oarsman and 2 divers. Technical advances involved changes from homemade spears, to arbaletes--a French slingpowered harpoon, to wire snares. Conservation efforts within the islands were limited, generally to protecting breeding stock but placing no restriction on the number of legal size specimens that could be caught in the open season, resulting in a serious depletion of the lobster. Changes in the marketing structure have also adversely affected the industry. Since 1959 Mt. Pleasant fishermen have had to deliver their catches to St. George, Grenada. In 1965 the wholesale value of their lobster catch was $5000-6000 (British West Indies dollars.) Approximately one-half of this amount was spent on the 2 transport vessels, leaving only a small amount for the fishermen. (Schroeder-Wisconsin)
W74-12774

WHO BEARS THE COST OF POLLUTION CONTROL. THE IMPACT ON THE DISTRIBUTION OF INCOME OF FINANCING FEDERALLY REQUIRED POLLUTION CONTROL,
Public Interest Economics Center, Washington, D.C.
N. S. Dorfman, and A. Snow.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-226 447, $5.75 in paper copy, $2.25 in microfiche. Council on Environmental Quality and Environmental Protection Agency, Washington, D.C., Report August 1973. 130 p, 11 fig, 24 ref. EQC 310.

Descriptors: *Cost transfer, *Pollution abatement, *Legislation, *Cost analysis, *Distribution, Equity, Income analysis, Federal government, Financing, Industries, Air pollution, Taxes, Economic impact, Budgeting, State governments.
Identifiers: *Pollution control costs, Automobile emission control, Service charges.

Federal pollution control legislation enacted by the end of 1972 may cost taxpayers over $26 billion by the end of the decade. The distribution of these additional costs among various income groups is assessed for 1972, 1976 and 1980. Estimates by the Council on Environmental Quality and the Environmental Protection Agency of the total costs are taken as given. Costs of antipollution measures are divided into three categories as those undertaken directly by alternative governmental levels; those which private industry must undertake; and those undertaken by the public for automobile emission controls. For these categories the percent distributions of annual costs were 31.4, 37.2 and 31.4 for 1972; 39.6, 30.4, and 30.0 for 1976; and 21.9, 41.9, and 36.2 for 1980, respectively. The relative impact on the costs distribution among income groups under the financing systems of each government level is also discussed. Two general approaches to measure the cost distribution among income groups are: an estimate of the average dollar costs per family unit, and an estimate of the effective tax rate for each group. Total estimated distributed costs per family unit range from $12 to $296 for 1972; $73 to $2,251 for 1976; and $84 to $1,511 for 1980. (Schroeder-Wisconsin)
W74-12781

THE POLITICAL INFLUENCE OF RESIDENTIAL CONSUMERS ON WATER RATES,
West Virginia Univ., Morgantown. Dept. of Economics.
P. Mann.
Water Resource Bulletin, Vol 9, No 5, p 976-984, 1973. 3 tab, 12 ref.

Descriptors: *Public utilities, *Water rates, *Regulation, Use rates, Political aspects, Administration, Water works, Pricing, Regression analysis.
Identifiers: Consumer leverage.

The regulatory process which determines water rates might be viewed as a bargaining process between regulator, utility managers, and consumers involving political, institutional, and economic influences. To illustrate that utility rates are a function of each, a large sample of publicly owned water utilities were subjected to linear regression analysis based on data collected for 335 publicly owned water utilities. Results indicate that cost and cost related factors were significant determinants of residential water rates. The political influence variable utilized the ratio of actual voters to population of voting age, emerged as significant only for minimum charges. Politically active constituencies receive price concessions reflected only for the minimum consumption level. The political activity-price linkage was also found more evident in small utilities than in large firms. The statistical analysis considered only the influence on water rate structures rather than rate levels. It may be, therefore, that the determination of a utility's total revenue requirements are but little influenced by political factors. Rather factors such as capital attraction and satisfactory operation probably will dominate revenue requirements. (Schroeder-Wisconsin)
W74-12786

THE WATER RESOURCES COUNCIL'S PROPOSED PRINCIPLES AND STANDARDS--AN ECONOMIC COMMENT,
University of Southern Mississippi, Hattiesburg. Dept. of Economics.
D. C. Williams, Jr., and C. P. Cartee.
Water Resources Bulletin, Vol 9, No 4, p 711-716, 1973. 2 fig, 1 ref.

Descriptors: *Project benefits, *Measurement, *Evaluation, *Recreation, Analytical techniques, Recreation demand, Water resources development.
Identifiers: *Water Resources Council, Economic benefits.

The expansion of objectives in natural resources planning lead the Water Resources Council in 1971 to propose a new set of princples and standards by which to evaluate projects. Two of the economic tools suggested by the Council are criticized. First, benefits arising from such projects were defined as equal to the total value of the increase in national output--the resultant consumer surplus plus the market price times increased quantity. Such a measure assumes that the seller could price discriminate, a condition not exhibited in the existing market. It is argued that increases in gross national product is a better measure of resultant benefits. A second proposal of the Council challenged is their assessment of recreational benefits. The Council's methods of simulating a price per recreation day implies that an arbitrary price be selected from a range and multiplied times the number of days demand at no charge. This method overstates the economic benefits because it does not consider that demand is a function of price. The real market would increase the benefits by multiplying the selected price times the quantity demanded at that price. (Schroeder-Wisconsin)
W74-12794

COSTS OF LAND SUBSIDENCE DUE TO GROUND WATER WITHDRAWAL,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4B.
W74-12867

COST OF SPRAY IRRIGATION FOR WASTE WATER RENOVATION,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-12889

FINANCING MUNICIPAL WASTE WATER TREATMENT FACILITIES, INCLUDING LAND UTILIZATION SYSTEMS,
Environmental Protection Agency, Washington, D.C. Div. of Municipal Waste Water Programs.
For primary bibliographic entry see Field 5D.
W74-12890

LARGE WASTEWATER IRRIGATION SYSTEMS: MUSKEGON COUNTY, MICHIGAN AND CHICAGO METROPOLITAN REGION,
Bauer Engineering, Inc., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-12891

OPTIMAL REGIONALIZATION OF WASTEWATER TREATMENT FOR WATER QUALITY MANAGEMENT,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-13048

POWERS OF THE STATE OF KENTUCKY IN IMPLEMENTING AN EFFLUENT TAX AS A PART OF AN INTERSTATE OHIO RIVER BASIN WATER POLLUTION CONTROL PROGRAM,
Kentucky Univ., Lexington. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W74-13051

A CONCEPTUAL AND EMPIRICAL ANALYSIS OF WATER PRICING IN MISSISSIPPI MUNICIPALITIES,
Mississippi Univ., Oxford. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6B.
W74-13054

WASTEWATER SYSTEM ALTERNATES: WHAT ARE THEY...AND WHAT COST,
Anderson-Nichols and Co., Boston, Mass. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W74-13071

WASTEWATER SYSTEM ALTERNATES: WHAT ARE THEY...AND WHAT COST,
Anderson-Nichols and Co., Boston, Mass. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W74-13072

ENVIRONMENTAL ASSESSMENT OF WATER-SYSTEM IMPROVEMENTS,
East Bay Municipal Utility District, Oakland, Calif.
For primary bibliographic entry see Field 5G.
W74-13265

RECOVER ALUM TO REDUCE WASTE-DISPOSAL COSTS,
Metcalf and Eddy, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-13285

THE ECONOMIC VALUE OF WATER FOR WASTE DILUTION: REGIONAL FORECASTS TO 1980,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5B.
W74-13297

EFFLUENT CHARGES-A PRICE ON POLLUTION,
Pennsylvania State Univ., University Park. Center for Air Environment Studies.
For primary bibliographic entry see Field 5G.
W74-13320

6D. Water Demand

WATER RESOURCES DISTRIBUTION OPTIMIZING,
C. Parvulescu.
Mimeo, n.d., 48 p.

Descriptors: *Water demand, *Water resources, *Water allocation(Policy), *Optimization, Waste water disposal, Economics, Technology, Water resources development, Water reuse, Industries, Mathematical studies, Stochastic processes, Dynamic programming, Optimum development plans, Water distribution(Applied), Water delivery, Water pollution effects, Water works, Pricing, Algorithms.
Identifiers: *Rumania.

The stochastic nature of natural flows, multiple conflicting user requirements and the varying impacts of prior uses on water quality have all lead to increasing demands for improved water management techniques. A modeling effort is proposed to analyze optimum combinations of users, modes of water distribution, recycling and treatment; and to establish the transition time of water flows. The procedure includes optimization through the minimization of design costs subject to given design criteria. Basic to the approach is the maximum utilization of positive impacts of internal recycling; the direct association of quantitative and qualitative aspects of water management and the utilization of prices to optimally allocate resources. A digital computation process with discreet values, digital simulation and dynamic programming procedures is used to form the required relationships under uncertainty. A series of models differentiated by the location of users--parallel, series; flow regime--natural or controlled; or the relative weight of qualitative versus quantative aspects is presented. Two algorithms yielding allocation pricing, treatment and recycling levels of water are discussed. A numerical example illustrating differences between the existing and proposed management tools is provided. (Schroeder-Wisconsin)
W74-12783

A STUDY OF HOW WATER QUALITY FACTORS CAN BE INCORPORATED INTO WATER SUPPLY ANALYSIS,
Ernst and Ernst, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-13030

THE IMPACT OF MAN-MADE LAKES ON RESIDENTIAL PROPERTY VALUES: A CASE STUDY AND METHODOLOGICAL EXPLORATION,
Toronto Univ. (Ontario), Dept. of Geography.
For primary bibliographic entry see Field 6B.
W74-13066

ARIZONA'S WATER RESOURCES,
Arizona Water Commission, Phoenix.
P. Briggs.
Arizona Engineer. Vol 26, No 7, p 5, 25, July, 1974.

Descriptors: *Water management(Applied), *Water demand, *Groundwater resources, Water resources development, *Colorado River, *Arizona, Groundwater, Surface waters, Wells, Aquifers.
Identifiers: *Central Arizona Project, Harquachola Valley.

Growth in Arizona's population is placing increased demand on the state's water supply. Potential water supplies lie with the vast underground storage still available and further development of Colorado River rights. Some of the demands can be absorbed through water conservation and transfer of water for different uses. Much of Arizona's groundwater supplies are located away from the areas of greatest need. A need is evident for development of statewide management plans for the water resources such as the Central Arizona Project. Until these plans are developed and inplemented, uses of the present water supply must be carefully analyzed and developed to aid and protect the public's needs. (Mastic-Arizona)
W74-13152

CLOUDS IN THE CRYSTAL BALL,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering.
J. E. McKee, and T. R. Rice.
Journal of the American Water Works Association, Vol 66, No 5, p 265-269, May, 1974. 3 fig, 3 tab, 8 ref.

Descriptors: *Population, *Forecasting, *Future planning(Projected), Water supply, Water reuse, Water conservation, *Nevada, Demand, *Water demand.
Identifiers: *Las Vegas(Nev.)

Population forecasting has become increasingly important in recent years. Various planners, including water-utility planners, need to know what future populations will be in areas that they serve in order to assure that people will be provided with

needed facilities. Water supply is one of many factors that influences the growth of United States communities. Moreover, social factors such as unemployment, crime, congestion, and racial problems may prove to be more significant than physical influences. A case study of the Las Vegas area shows that growth there will not be curtailed by a shortage of water. Even with a forecast of one million people by 2000 A.D., adequate water will be available for municipal use. Thereafter it may become necessary to reclaim, demineralize, and reutilize waste water for potable purposes. (Sandoski-FIRL)
W74-13277

FEASIBILITY STUDY FOR THE ESTABLISHMENT OF DALMAJ PILOT PROJECT,
Institute for Applied Research on Natural Resources, Bagdad (Iraq).
For primary bibliographic entry see Field 3F.
W74-13346

6E. Water Law and Institutions

STATE-COUNTY INTERAGENCY PROCEDURES FOR IMPOSING ENVIRONMENTAL QUALITY CONTROLS ON WATER-ORIENTED DEVELOPMENT ACTIVITIES,
Whittenburg, Vaughan Associates, Inc., Landover, Md.
For primary bibliographic entry see Field 5G.
W74-12751

COASTAL ZONE MANAGEMENT PROBLEMS.
Oregon State Univ., Corvallis. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 470, $4.75 paper copy, $2.25 in microfiche. SEMN WR 018-74, January 1974. 90 p. OWRR A-999-ORE(16).

Descriptors: *Coasts, *Oregon, *Conservation, *Management, Regulation, Dredging, Regional development, Attitudes, Estuaries, Regional analysis, Estuarine environment, California, Institutions, Legislation, Institutional constraints.
Identifiers: Commissions.

The coastal zone, composed of the coastal plains, the continental shelf, bays, estuaries, lagoons and deltas is an area rich in natural resources and concentrated human activities. Lack of a comprehensive inventory of coastal resources, its unique and fragile nature, unbridled and poorly conceived development, increased population activities, uncontrolled harvesting of resources and limited local financial resources to facilitate adequate provision of public services within the zone are among the problems plaguing the coastal area. Dredging and filling have particularly affected the environment through altered water circulation, physical removal of organisms, nutrient releases, and increases in turbidity, suspended solids, and heavy metal levels. In part, coastal states have relied almost exclusively upon zoning and restrictive regulation to manage the zone; however their parochial nature and lack of a basis for comprehensive planning have generally made them inefficient as management tools. Two coastal commissions created in California and Oregon have been charged with the development of comprehensive enforceable plans for the orderly development of the zone. One management technique, a diversity approach, encourages clustering of development only within selected estuarine systems. Perceptions of preservation versus development of the zone held by local groups and a development agency are also discussed. (See W74-12757 thru W74-12765) (Schroeder-Wisconsin)
W74-12756

PROBLEMS ON CALIFORNIA'S COAST,
California Coastal Zone Conservation Commission, North Coastal Region, and California State Univ., Humboldt, Arcata.
D. W. Hedrick.
In: Coastal Zone Management Problems, seminar conducted by Water Resources Research Institute, Oregon State University, Fall 1973, Corvallis. Report SEMN WR 018-74, January 1974, p 21-28.

Descriptors: *Institutional constraints, *Coasts, *Regional development, California, Water resources development, Administrative agencies, Permits, State governments, Legislation, Conservation, Bodies of water.
Identifiers: *Coastal zone, Conservation commissions, Non-tidal bodies of water.

A 1972 California referendum created the California Coastal Zone Conservation Commission (CCZC) and six Regional Coastal Zone Conservation Commissions (RCZC) to study the coastal zone and to develop comprehensive, coordinated, enforceable plans for the orderly management and development of the area. An important element of the act was a permit system requiring permits 1000 yards landward from the mean high tide line and seaward to the three mile limit. Any 'development' must have a permit by a RCZC, or if appealed, confirmed by the CCZC. In sum, the CCZC has the overall coordinating role for planning development and hearing on appeal. While the state creates overall guidelines it is the responsibility of the six RCZC to effectively create the plan for adoption by the state. The North Coastal Region Commission's plan development has entailed grouping and studying of a number of interrelated resources including marine and coastal environment, recreation, power plant siting, and transportation. RCZCs also are required to formulate interim permit procedures. By August 1973, 152 administrative permits were approved; 8 were pending and none denied. Six exemptions were also approved. Of equal interest, more than 30 lawsuits have been filed by parties on both sides of the conservation issue. (See also W74-12756) (Schroeder-Wisconsin)
W74-12759

COASTAL ZONE LEGISLATION,
Oregon Univ., Eugene. Oregon Students Public Interest Research Group.
H. Richmond.
In: Coastal Zone Management Problems, seminar conducted by Water Resources Research Institute, Oregon State University, Fall 1973, Corvallis. Report SEMN WR -018-74, January 1974. p 81-85.

Descriptors: *Management, *Coasts, *Oregon, *Legislation, Regional development, Planning, Water resources development, Zoning, Institutions, Grants, Conservation, State governments.
Identifiers: Commissions.

The Federal Coastal Zone Management Act of 1972 (CZMA) and Oregon's Coastal Conservation and Development Commission (OCCDC), created in 1971 represent two attempts on the state and federal level to preserve, protect, restore and develop the nation's coastal zones' natural resources. Under CZMA, coastal states are eligible for federal grants to aid in the preparation of management programs for the states' coastal land and water resources. Such plans must include an inventory and designation of areas of particular concern within its coastal zone, delineation of impact of alternative land and water uses and a discussion of proposed control mechanisms to carry out suggested use management plans. In Oregon, the Oregon Land Conservation and Development Commission (LCDC) was provisionally designated to receive and administer the grants. The LCDC may delegate any of its functions to OCCDC, provided prior approval to any delegated action is given. The OCCDC represents the 1971 Oregon Legislature's attempt to limit changes to Oregon coastal resources. The 30 member commission from several coastal counties is charged with studying the zone's resources, to recommend their highest and best use, and develop a comprehensive coastal management plan. The OCCDC budget for 1973-75 to carry out its responsibilities exceeds $654,000. (See also W74-12756) (Schroeder-Wisconsin)
W74-12764

PLANNING FOR DIVERSITY,
Oregon Univ., Eugene. Oregon Students Public Interest Research Group.
R. Benner.
In: Coastal Zone Management Problems, seminar conducted by Water Resources Research Institute, Oregon State University, Fall 1973, Corvallis. Report SEMN WR 018-74, January 1974, p 87-90.

Descriptors: *Regional development, *Natural resources, *Coasts, *Regulation, Legislation, Management, Oregon, Zoning, Control, Comprehensive planning, Local governments, Conservation.

Oregon's former reliance upon zoning and restrictive regulations to manage land and water coastal resources have proved inadequate. Regulations implemented by a myriad of governmental jurisdictions did not provide for comprehensive consideration of the total environmental impact of any regulated activity. The effectiveness of zoning has also been limited, partially as a result of political influence and lack of a regional perspective. The recent Bill 687 was designed to protect coastal resources 'through the development and maintenance of a balance between conservation and developmental interests with respect to such resources.' The Oregon Coastal Conservation and Development Commission (OCCDC) was created to develop comprehensive plans to achieve this end. The Commission's impact on coastal resources depends upon its definition of 'balance'. Using one approach, the plan would set broad, uniform policies and leave local bodies to determine the conservation and development mix--'dispersed uniform development'. Under a second approach, a different policy would be established for each area and guidance for implementation given. Presently OCCDC is developing a single set of estuary policies which may endanger coastal resources. Undisturbed estuaries will be destroyed and total environmental degradation may be greater even though maximum damage to any individual site may be less. (See also W74-12756) (Schroeder-Wisconsin)
W74-12765

MANAGEMENT OF FISHERY RESOURCES FOR OPTIMUM RETURNS. WOULD IT WORK IN THE GULF OF MEXICO,
Rhode Island Univ., Kingston. Law of the Sea Inst.
For primary bibliographic entry see Field 6C.
W74-12766

UNCLE IS MOVING IN,
National Canners Association, Washington, D.C. Fishery Products Committee.
H. R. Robinson.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 75-80.

Descriptors: *Federal government, *Legislation, *Commercial fishing, Public health, Regulation, Fish handling facilities, Inspection, Import.
Identifiers: *Senate Bill 2824, Federal fish inspection, Insterstate commerce, Seafoods.

The impact on producers and consumers of the proposed Wholesome Fish and Fishery Products Act of 1971 is assessed. The act provides for surveillance of foreign and domestic establishments and vessels handling interstate or foreign fish or fishery products, and for the establishment of sanitation standards and quality control. The Secretary of HEW will issue certificates to those complying with the standards. The bill provides that inspectors shall have reasonable access to vessels and establishments; denial of access may be grounds to revoke certificates. The impact of the bill is multifaceted. A wide range of persons may be required to hold certificates, e.g., warehousemen, truckers, etc. Failure to meet these standards could lead to prohibition of imports of foreign fish or fishery products. Since the U.S. is dependent on such imports, such a restriction could have significant impact on consumers. Two other sections of the bill are discussed. The first provides $35 million initial capital loans to establishments, while a $40,000 loan restriction still exists. The other section discussed provides for the surveillance for dangerous materials in all foods. The Secretary of HEW will propose guidelines specifying all dangerous materials and the screening procedures to be followed. (Schroeder-Wisconsin)
W74-12769

FOOD AND DRUG ADMINISTRATION GUIDELINES FOR CONTAMINANTS IN FISHERY PRODUCTS,
Food and Drug Administration, Washington, D.C. Bureau of Foods.
For primary bibliographic entry see Field 5G.
W74-12770

ADMINISTRATION OF GROUNDWATER AS BOTH A RENEWABLE AND NONRENEWABLE RESOURCE,
Idaho Bureau of Mines and Geology, Moscow.
For primary bibliographic entry see Field 4B.
W74-12792

GUIDELINES FOR DEVELOPING OR REVISING WATER QUALITY STANDARDS, UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
Environmental Protection Agency, Washington, D.C. Div. of Water Planning.
For primary bibliographic entry see Field 5G.
W74-12797

WATER QUALITY STRATEGY PAPER, SECOND EDITION, A STATEMENT OF POLICY FOR IMPLEMENTING THE REQUIREMENTS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS AND CERTAIN REQUIREMENTS OF THE 1972 MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT.
Environmental Protection Agency, Washington, D.C. Div. of Water Planning.
For primary bibliographic entry see Field 5G.
W74-12798

THE ROLE OF LAND TREATMENT OF WASTEWATER IN THE CORPS OF ENGINEERS WASTEWATER MANAGEMENT PROGRAM,
Corps of Engineers, Washington, D.C. Waste water Management Task Force.
For primary bibliographic entry see Field 5D.
W74-12897

FOREST SERVICE POLICY RELATED TO THE USE OF NATIONAL FOREST LANDS FOR DISPOSAL OF WASTEWATER AND SLUDGE,
Forest Service (USDA), Washington, D.C. Div. of Watershed Management.
For primary bibliographic entry see Field 5D.
W74-12899

SPRAY IRRIGATION--THE REGULARTORY AGENCY VIEW,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Ground Water Quality Management Unit.
For primary bibliographic entry see Field 5D.
W74-12900

FEDERAL ASSISTANCE PROGRAMS FOR WATER POLLUTION CONTROL TECHNOLOGY DEVELOPMENT,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W74-12959

RESERVOIR PROJECT REAUTHORIZATION: EXAMPLES OF PAST USE AND ANALYSIS OF APPLICATION TO LAKE LANIER,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 4A.
W74-13046

POWERS OF THE STATE OF KENTUCKY IN IMPLEMENTING AN EFFLUENT TAX AS A PART OF AN INTERSTATE OHIO RIVER BASIN WATER POLLUTION CONTROL PROGRAM,
Kentucky Univ., Lexington. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W74-13051

TOWARD A POLITICAL SCIENCE OF WATER RESOURCES DECISIONS,
Wisconsin Univ., Madison. Dept. of Political Sciences.
For primary bibliographic entry see Field 6B.
W74-13063

RECENT SOCIOLOGICAL CONTRIBUTIONS TO WATER RESOURCES MANAGEMENT AND DEVELOPMENT,
Kentucky Univ., Lexington. Center for Developmental Change.
For primary bibliographic entry see Field 6B.
W74-13064

SUMMARY OF WATER QUALITY STANDARDS FOR THE INTERSTATE WATERS OF IOWA,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-13185

INTERIM EFFLUENT GUIDANCE FOR NPDES PERMITS,
Environmental Protection Agency, Washington, D.C. Permit Program Div.
For primary bibliographic entry see Field 5G.
W74-13214

P, N:P STANDARDS FOR HAWAIIAN STREAMS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W74-13217

ARE THE GREAT LAKES THREATENED,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5G.
W74-13218

THE U.S.S.R.: OCEAN USE AND OCEAN LAW,
Rhode Island Univ., Kingston. Law of the Sea Inst.
M. W. Janis, and D. C. F. Daniel.
Occasional Paper No 21, Law of the Sea Institute, May, 1974. 22 p, 66 ref.

Descriptors: *International waters, *International law, *United Nations, *Military aspects, *Navigation, Ships, Transportation, Fishing, Coasts, Law of the Sea, Shores, Foreign trade, Legal aspects, Jurisdiction, Commercial fishing, Oil industry, Oceanography, Boundary disputes, Ocean beds, Political aspects, Oceans.
Identifiers: *USSR.

The Soviet Union is one of the greatest beneficiaries of the freedom of the sea. Naval strength allows use of the oceans for defensive and offensive deployments, showing of the flag around the world, and at times the exercise of gunboat diplomacy to influence smaller nations through a show of naval force. The Russian merchant marine is a major source of foreign money to control the balance of payments, and Soviet fishing efforts provide 20% of the animal protein in the Russian diet. For all the above reasons, the Soviet stance on revising the law of the sea is conservative, aimed at maintaining the status quo. Proposals to extend national jurisdication over international waters, to create a supernational agency to control the seas, or to limit the tradiational freedom of navigation and exploitation of international waters are met cautiously as representing possible serious constraints on major Soviet economic and military advantages. However, the political need to placate third world and poor nations demanding greater control over distribution of the ocean's riches dictates some flexibility in negotiation. In general, the U.S.S.R. opposes an international ocean regulatory institution or extension of national boundaries into the sea, preferring to compromise and grant some preferential fishing rights to coastal nations and international environmental protection compacts. In this way, hopefully, the Soviet exploitation of ocean resources will be impinged only to a minor degree. (Salley-Florida)
W74-13220

PROPOSITION ONE--FOR NEW YORK'S ENVIRONMENT,
For primary bibliographic entry see Field 5G.
W74-13222

ROGUE NATIONAL WILD AND SCENIC RIVER, OREGON (NOTICE OF REVISED DEVELOPMENT AND MANAGEMENT PLANS).
Bureau of Land Management, Washington, D.C.
Federal Register, Vol 37, No 131, p 13408-13415, July 7, 1972.

Descriptors: *Regulation, *Wild Rivers Act, *Rivers, *Oregon, *Adoption of practices, Land management, Land development, Federal project policy, Planning, Natural resources, Aesthetics, Scenery, Water resources, Resources development, Inter-agency cooperation, Water law, Legislation, Recreation, Land reclamation, Water utilization, Water resources development.
Identifiers: *Administrative regulations.

Notice is made of a proposed combined plan for development, operation and management of the Rogue National Wild and Scenic River to be administered by the Bureau of Land Management (BLM) and the U.S. Forest Service (FS). This single plan revises and combines the BLM and FS Master Plans for the Rogue River Component of the National Wild and Scenic Rivers system. Although the original BLM and FS Master Plans were closely coordinated, there was some differences in language which caused public confusion. The boundaries of the Rogue Wild and Scenic River and areas of responsibility for BLM and FS remain unaltered. The only substantial revision pertains to expansion of existing lodges

on the stretch of river classified as Wild River. Under the original BLM Master Plan, lodge expansion was permitted provided that BLM approved the construction and site plans. The new combined plan prohibits lodge expansion. (Ritchie-Florida)
W74-13227

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-13228

METHODS TO EXPEDITE ENVIRONMENT PROTECTION: INTERNATIONAL ECOSTANDARDS,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 5G.
W74-13229

RESOLVING WATER RESOURCE RIDDLES,
Minnesota Dept. of Natural Resources, St. Paul. Div. of Waters, Soils and Minerals.
For primary bibliographic entry see Field 3F.
W74-13230

AGRICULTURAL DRAINAGE AND THE PUBLIC INTEREST, (PART I),
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 3F.
W74-13232

NEW LEGAL APPROACHES TO ENVIRONMENTAL CONTROL,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5G.
W74-13271

LITIGATION UNDER PL 92-500: A STATUS REPORT,
For primary bibliographic entry see Field 5G.
W74-13289

MCA ENDORSES WASTE DISPOSAL PROVISIONS.
For primary bibliographic entry see Field 5E.
W74-13291

RESEARCH AND DEVELOPMENT,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5G.
W74-13292

THE EUROPEAN SCENE,
Emschergenossenschaft and Lippeverband, Essen (West Germany). Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W74-13293

THE INSTITUTE AND EUROPE,
For primary bibliographic entry see Field 5G.
W74-13294

WATER ACT 1973 RIVERS (PREVENTION OF POLLUTION) ACT 1951 ATTORNEY GENERAL V. WELLINGBOROUGH UDC.
For primary bibliographic entry see Field 5G.
W74-13296

MEETING THE NPDES DEADLINE: DOES CLOSE ONLY COUNT IN HORSESHOES.
For primary bibliographic entry see Field 5G.
W74-13314

6F. Nonstructural Alternatives

MAN AND WATER, THE SOCIAL SCIENCES IN MANAGEMENT OF WATER RESOURCES.
Kentucky Univ., Lexington. Water Resources Inst.
For primary bibliographic entry see Field 6B.
W74-13058

ANTHROPOLOGICAL CONTRIBUTIONS TO THE CULTURAL ECOLOGY AND MANAGEMENT OF WATER RESOURCES,
Washington Univ., Saint Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 6B.
W74-13060

ROLE OF GEOGRAPHY IN WATER RESOURCES MANAGEMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6B.
W74-13062

SPECIAL FLOOD HAZARD INFORMATION REPORT: DRY CREEK, DOUGHERTY COUNTY, GEORGIA.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W74-13067

FLOOD PLAIN INFORMATION: SOPE CREEK, VICINITY OF MARIETTA, GEORGIA.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W74-13068

FLOOD PLAIN INFORMATION, LITTLE NESHAMINY CREEK, BUCKS COUNTY, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W74-13069

SPECIAL FLOOD HAZARD INFORMATION REPORT, CHATTAHOOCHEE RIVER, ROARING BRANCH, WERACOBA CREEK AND LOWER BULL CREEK, VICINITY OF COLUMBUS, GEORGIA.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W74-13070

APPLICATION OF REMOTE SENSING TO STATE AND LOCAL GOVERNMENT (ARSIG),
Arizona Univ., Tucson. Office of Arid Lands Studies.
K. E. Foster, and J. D. Johnson.
OALS Bulletin 7. April, 1974. 81 p, 31 fig, 45 ref. NASA NGL 03-002-313.

Descriptors: *Remote sensing, Hydrology, *Stock water, *Forest management, *Floodplain zoning, Mapping, Planning future planning(Projected), Water zoning, Riparian plants, Land-use, Municipal water, Water supply, Reservoirs, Watersheds(Basins), Semiarid climates, *Arizona, Streamflow, Water loss, Evaporation, Groundwater recharge, Water yield.
Identifiers: Environmental monitoring, Stock tanks, Agricultural water.

Applications are described of remote sensing techniques using space and aircraft imagery for service-oriented programs working with local and state agencies to assist in planning, zoning, and environmental monitoring. This system is being used to study the hydrology of earth stock tanks on a semiarid watershed in north-central Arizona. These studies will determine the effect stock tanks have on streamflow, especially that critical to Phoenix municipal and agricultural water supply. The water loss by evaporation from the surfaces of the tanks is measured by specifically designed floats calibrated to determine stock tank depths. If studies show excessive loss, results could lead to regulation of construction of new tanks. Remote sensing techniques are also used to derive forest stocking equations to measure and maintain optimum forestry density for ideal natural resource production and use, especially increased water yields that rely heavily on forest management techniques. The aerial reconnaissance used in remote sensing is described and supplemented by map figures for use in determining groundwater recharge areas and the delineation of floodplain zones, information critical in land-use planning. (Michael-Arizona)
W74-13140

APPLICATION OF REMOTE SENSING TECHNIQUES IN LAND USE PLANNING: FLOODPLAIN DELINEATION,
Cochise County Planning Dept., Ariz.
For primary bibliographic entry see Field 4A.
W74-13142

YOUR LAKE INSURANCE POLICY,
9 Minnesota Dept. of Natural Resources, St. Paul. Div. of Waters, Soils and Minerals.
M. Hambrock.
The Minnesota Volunteer, p 11-17, January-February, 1973. 3 illus.

Descriptors: *Minnesota, Water zoning, Water law, *Water policy, *Water management(Administrative), Local governments, Land use, Flood plain zoning, Water resources development, Zoning, State governments, Planning, Water management(Applied), Administrative agencies, Management, Legislation, Environmental effects, Land development, Land management.

The Minnesota Shoreland Zoning Act provides minimum state-wide criteria for the development of navigable surface waters. The Act is administered on the county level and overseen by the State Department of Natural Resources. Counties were required to specify minimum criteria for recreational development of their lakes and rivers or to adopt the state-wide criteria. Although ideally criteria would be modified for each body of water, the time constraint imposed by the Act made determination of individual criteria impractical. The state-wide plan recommends three use classifications, each with different criteria. The first class, Natural Environment Lakes and Streams, includes small lakes subject to rapid overdevelopment and eutrophication. Specially designated trout streams and rivers in the Federal wild and Scenic Rivers program are also in this class. These waters need significant protection because of their unique natural characteristics or their unsuitability for development. The second category, Recreation Development Lakes, are already moderately developed and are suited to further development and water oriented recreation. The third class, General Development Lakes and Streams, are those already heavily developed or able to withstand intense development. (Barnes-Florida)
W74-13231

6G. Ecologic Impact Of Water Development

STATE-COUNTY INTERAGENCY PROCEDURES FOR IMPOSING ENVIRONMENTAL QUALITY CONTROLS ON WATER-ORIENTED DEVELOPMENT ACTIVITIES,
Whittenburg, Vaughan Associates, Inc., Landover, Md.
For primary bibliographic entry see Field 5G.
W74-12751

DEVELOPMENT AND MANAGEMENT OF GROUNDWATER IN RELATION TO PRESERVATION OF DESERT PUPFISH IN ASH MEADOWS, SOUTHERN NEVADA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 4B.
W74-12752

THE THRESHOLD OF ENVIRONMENTAL REASON,
Corps of Engineers, Atlanta, Ga. South Atlantic Div.
G. W. Allen.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 56-61.

Descriptors: *Environment, *Protection, Pollution abatement, Social aspects, Comprehensive planning, Political aspects.
Identifiers: *Environmental quality.

The public's rising environmental sensitivity represents a turnabout from the earlier indifference. The turnabout has not been without costs, however; and these costs have generally been overlooked. First, the assessment of the environmental impact of any project is time consuming. Data collection may involve 6 months of work; analysis at least 2 more. Following the preparation of a statement, other governmental entities may review and recommend changes in the project. In addition to the assessment time a plethora of recent legislative environmental enactments have lead to confusion over the appropriate process to follow. In contrast to the extensive project data analysis, many public environmental statements are based on inadequate data, a distortion which could undermine acceptance of reliable data in the future. While not openly stated, improved environmental quality will have costs. At present the environmental picture is a 100% operation. The fault and the work always appears to lie 100% on other's shoulders. Once the realization occurs that environmental costs exist and are shared by all in varying degrees, a rational environmental quality program could emerge. Cost-payments for waste water treatment plants, decreased power supplies, etc., must be weighed against improved environmental quality to best determine the optimum quality level. (Schroeder-Wisconsin)
W74-12768

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED BYRON STATION UNITS 1 AND 2, COMMONWEALTH EDISON COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-12902

FINAL ELK RIVER REACTOR SITE SURVEY, RESULTS AND SUMMARY - JULY 23, 1974.
United Power Association, Elk River, Minn.
For primary bibliographic entry see Field 5B.
W74-12903

A SURVEY OF THE ANIMAL COMMUNITY OF THE MAIN POND AT CASTOR HANGLANDS NATIONAL NATURE RESERVE, NEAR PETERBOROUGH,
For primary bibliographic entry see Field 2H.
W74-12997

THE INTERAGENCY CONFERENCE ON THE ENVIRONMENT - A POST-CONFERENCE SURVEY,
California Univ., Livermore. Lawrence Livermore Lab.
G. D. Sauter, and C. F. Miller.
Available from NTIS, Springfield, Va 22161, as UCRL-51588, $3.25/copy, $2.25/microfiche. Report No UCRL-51588, June 11, 1974. 17 p.

Descriptors: *Conferences, *Symposia, *Technical societies, *Surveys, *Environment, Monitoring, Remote sensing, Model studies, Transport, Air, Water, Planning, Land use, Data collections, Data processing, Data storage and retrieval, Data transmission.

The Interagency Conference on the Environment, held at the Lawrence Livermore Laboratory in October 1972, brought together nearly 200 representatives of the U.S. Environmental Protection Agency (EPA), the Atomic Energy Commission (AEC), the National Aeronautics and Space Administration (NASA), and the various AEC and NASA laboratories. It was held to promote an effective exchange of ideas and information on environmental research and to explore ways in which the capabilities and facilities of these laboratories might be more effectively used to complement and supplement existing EPA environmental research programs. Some months after the conference, many of the participants were interviewed to determine the effectiveness and the impact of the conference. They were asked their opinions regarding the desirability and potential for establishing cooperative multi-agency environmental research programs and the barriers to such cooperation that remain to be overcome. This survey indicated that, although only a few specific research projects resulted from it, the conference was considered very successful as a medium of information exchange. Further, given some of the perceptions of 'other agency' attitudes, the current level of interagency cooperation and coordination is not likely to increase. Some guidelines for enhancing cooperation are suggested. (Houser-ORNL)
W74-13118

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 15. MAMMALS OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ., Stevens Point. Museum of Natural History.
C. A. Long.
Available from NTIS, Springfield, Va. 22161 as ANL/ES-40, Vol 15; $5.25/copy, $2.25/microfiche. Argonne National Laboratory, Report No ANL/ES-40, Vol 15, May 1974. 108 p, 35 fig, 1 tab, 66 ref.

Descriptors: *Mammals, *Surveys, *Mammal groupings, *Wildlife, Watersheds(Basins), Drainage area, *Lake Michigan, *Census, Data collections, Varieties, Aesthetics, Value, Distribution, Habitats, Sites, Nuclear powerplants, Environmental effect.

A catalog is presented of the wild mammals that inhabit the land in the drainage basin of Lake Michigan. For each species identified, data are presented on its aesthetic attributes, value, status, and distribution. A short discourse is included on the habitat preference, home range, and zoogeography of Recent mammals. This faunal account maps and documents the distribution of the mammals for planning to minimize the disruption of the natural environment by the siting of nuclear plants and other developments. The known economic values of wild animals and their aesthetic attributes are described. (Houser-ORNL)
W74-13121

ECOLOGICAL CONSIDERATIONS OF DEPLETED URANIUM MUNITIONS,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5C.
W74-13122

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED BRAIDWOOD STATION, COMMONWEALTH EDISON COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-13129

MAN'S IMPACT ON THE COLORADO RIVER IN THE GRAND CANYON,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 4C.
W74-13149

THE ENVIRONMENT AND WATER-RESOURCE DEVELOPMENT,
National Wildlife Federation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-13221

RED BOILING SPRINGS WATERSHED PROJECT, MACON AND CLAY COUNTIES, TENNESSEE, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-13223

ALPINE LAKE PROJECT ALPINE, TEXAS, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W74-13224

TREXLER LAKE, JORDAN CREEK, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W74-13225

THIMBLE SHOAL CHANNEL (MAINTENANCE DREDGING) (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W74-13226

ROGUE NATIONAL WILD AND SCENIC RIVER, OREGON (NOTICE OF REVISED DEVELOPMENT AND MANAGEMENT PLANS).
Bureau of Land Management, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-13227

METHODS TO EXPEDITE ENVIRONMENT PROTECTION: INTERNATIONAL ECOSTANDARDS,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 5G.
W74-13229

THE WATER INDUSTRY IN THE DECADE OF ENVIRONMENTAL CONCERN,
Gilbert (J.B.) and Associates, Sacramento, Calif.
For primary bibliographic entry see Field 5G.
W74-13268

NEW LEGAL APPROACHES TO ENVIRONMENTAL CONTROL,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5G.
W74-13271

ENVIRONMENTAL-IMPACT ASSESSMENT FOR PLANT DESIGN AND OPERATION,
Jones and Stokes Associates, Inc., Sacramento, Calif.
For primary bibliographic entry see Field 5G.
W74-13273

LITIGATION UNDER PL 92-500: A STATUS REPORT,
For primary bibliographic entry see Field 5G.
W74-13289

ECOLOGICAL SURVEY OF THE VENEZUELAN WESTERN LLANOS: I. THE REGIONAL ECOLOGICAL UNITS, (IN SPANISH),
Universidad de Los Andes, Merida (Venezuela). Facultad de Ciencias.
G. Sarmiento, M. Monasterio, and J. Silva.
Acta Cient Venez, Vol 22, No 2, p 52-60, 1971, Illus. English summary.
Identifiers: Vegetation, *Venezuela(Llanos), *Land classification, Landscaping.

The landscape approach to land evaluation is applied as a preliminary reconnaissance of vegetation and environment in an area of 30,000 sq km in the Venezuelan Western Llanos. The land-system methodology was adapted to the delimitation of regional units showing both morphological and genetical homogeneity. The Western Llanos form part of a sedimentary basin of levelled topography and low altitude, covered with alluvial and eolian deposits of Pleistocene and recent age. Several land forms, such as: terraces, alluvial fans, flood plains and eolian plains, resulted as a consequence of Quaternary geomorphogenetical processes. The regional climate is uniform, with a very definite alternation of humid and dry periods, the dry one lasting from 4-5 mo. The natural vegetation is grouped in 4 main types: forests, humid savannas, dry savannas, dry savannas and swamps. On a physiognomical-ecological basis a preliminary classification of each type is attempted. Seven landscapes and 31 land systems are recognized in this area.--Copyright 1973, Biological Abstracts, Inc.
W74-13355

7. RESOURCES DATA

7A. Network Design

THE ACCURACY OF RADAR-DERIVED RAINFALL MEASUREMENTS IN HILLY TERRAIN,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W74-13009

7B. Data Acquition

A VERSATILE SOIL WATER FLUX METER,
Agricultural Research Service, Madison, Wis. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 2G.
W74-12837

A NEW METHOD FOR DETERMINING AND INTERPRETING DISPERSION COEFFICIENTS IN POROUS MEDIA,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 2F.
W74-12856

A REVIEW OF THE BIOCHEMICAL OXYGEN DEMAND (BOD-5) TEST,
Beak Consultants Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5A.
W74-12947

AN IMPROVED SNOW STUDY KIT,
Maine Cooperative Fishery Unit, Orono.
V. B. Richens, and C. G. Madden.
J Wildl Manage. Vol 37, No 1, p 109-113, 1973. Illus.

Descriptors: *Snow, Snow surveys, Surveys, Precipitation gages.
Identifiers: *Kit.

A modification of the National Research Council of Canada (NRC) and Cold Regions Research and Engineering Laboratory (CRREL) snow study kits was assembled due to unavailability of the former, high cost and large size of the latter, and because of specific project needs. This kit has proven satisfactory during 2 winters for measuring snow characteristics under a variety of weather conditions. It costs less than existing kits, is simply designed, is easily carried, and it may be made locally.--Copyright 1973, Biological Abstracts, Inc.
W74-12967

TRAJECTORY SENSITIVITY PROFILES IN A CLASS OF DISTRIBUTED OPTIMAL WATER QUALITY CONTROL SYSTEMS,
Newark Coll. of Engineering, Newark.
H. J. Perlis, and E. M. Duckworth, Jr.
Isa (Instrum Soc Am) Trans. Vol 12, No 1, p 62-69, 1973. Illus.

Descriptors: *Control systems, Dissolved oxygen, Aeration, Effluents.
Identifiers: Distributed, Optimal, Profiles, Sensitivity, Trajectory, State vector trajectory sensitivity.

The techniques of state vector trajectory sensitivity are extended to a class of distributed parameter environmental optimal control systems. The procedure is applied to develop the sensitivity coefficient profiles for a dynamic optimal water quality system which employs a modified Streeter and Phelps dissolved O2 model. The nominal system incorporates an optimal 2-element control vector: 1 for artificial aeration control and the other for effluent discharge control. An algorithm is presented for the simultaneous computation of the nominal system response and the sensitivity profiles. Numerical examples are presented to illustrate the method.--Copyright 1973, Biological Abstracts, Inc.
W74-12970

COMPARISON OF MEAN RAIN CATCH OF VARIOUS GAUGE NETWORKS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wassertau, Hydrologie und Glaziologie.
For primary bibliographic entry see Field 2B.
W74-12976

REMOTE SENSING OF THE MOISTURE CONTENT OF THE ATMOSPHERE AND UNDERLYING SURFACE,
K. Ya. Kondrat'yev, V. V. Melent'yev, Yu. I. Rabinovich, and Ye. M. Shul'gina.
Soviet Hydrology, Selected Papers No 2, p 142-151, 1973. 3 fig, 1 tab, 37 ref. Translated from Water Resources (Vodnyye resursy), No 2, p 58-68, 1973.

Descriptors: *Remote sensing, *Moisture content, *Oceans, *Radio waves, Satellites(Artificial), Soil moisture, Atlantic Ocean, Pacific Ocean, Indian Ocean, Atmosphere, Microwaves.
Identifiers: *USSR, Kosmos-243 satellite.

Theoretical and experimental investigations of the radiothermal noise field of the earth-atmosphere system and the successful experiment on radiothermal measurements from Kosmos 243 showed the promise of thermal radar methods for the remote sensing of the moisture content of the atmosphere and upper soil layer. Tabulated data showed that the emissivity of the underlying soil surface decreased with increasing water content. Radiometric measurements made by the Kosmos-243 satellite showed that the average latitudinal distribution of total moisture was similar over the Pacific, Atlantic, and Indian oceans. The average water content was approximately 0.2 kg/sq m; that is, approximately 1% of the water was in the liquid droplet state. (Humphreys-ISWS)
W74-12982

ERRORS OF AERIAL SURVEY OPERATIONS AND OFFICE PROCESSING OF DATA IN AIRCRAFT MEASUREMENTS OF DISCHARGES,
For primary bibliographic entry see Field 7C.
W74-12986

AQUIFER ANALYSIS USING BACKWARD DIFFERENCE METHODS,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-13012

STUDY OF MEANS OF AUTOMATICALLY CLASSIFYING PLANKTON,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 5A.
W74-13078

APPLICATION OF REMOTE SENSING TO STATE AND LOCAL GOVERNMENT (ARSIG),
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6F.
W74-13140

APPLICATION OF REMOTE SENSING TECHNIQUES IN LAND USE PLANNING: FLOODPLAIN DELINEATION,
Cochise County Planning Dept., Ariz.
For primary bibliographic entry see Field 4A.
W74-13142

NATURAL RESOURCE INVENTORY FOR URBAN PLANNING UTILIZING REMOTE SENSING TECHNIQUES,
Arizona Univ., Tucson. Office of Arid Lands Studies. Office of Arid Lands Studies, Arizona Univ., Tucson.
For primary bibliographic entry see Field 6B.
W74-13143

DEVELOPMENT OF A FLOATING OIL SLICK DETECTOR.
URS Research Co., San Mateo, Calif.
For primary bibliographic entry see Field 5A.
W74-13171

AERIAL OBSERVATIONS OF SUSPENDED-SEDIMENT PLUMES IN SAN FRANCISCO BAY AND THE ADJACENT PACIFIC OCEAN,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W74-13180

A MEMBRANE FILTRATION TECHNIQUE FOR THE ENUMERATION OF ESCHERICHIA COLI IN SEAWATER,
Ministry of Agriculture, Fisheries and Food. Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 5A.
W74-13237

BOD MEASURING APPARATUS,
For primary bibliographic entry see Field 5A.
W74-13242

FLUID ANALYZER WITH VARIABLE LIGHT PATH,
Gam Rad, Inc., Detroit, Mich. (assignee)
J. J. Shea.
United States Patent 3,810,695. Issued May 14, 1974. Official Gazette of the United States Patent Office, Vol 922, No 2, p 561, May 1974. 1 fig.

Descriptors: *Patents, Analyzers, *Instrumentation, Liquids, *Turbidity, Pollutant identification.
Identifiers: *Turbidimeters, *Fluid analyzers.

A turbidimeter or fluid analyzer was patented. The length of its light path is selectively variable so that different ranges of turbidity or contamination can be detected. (Prague-Firl)
W74-13252

TEMPERATURE-CONTROLLED FLUID MANIFOLD FOR A FLUID SYSTEM OF AN AUTOMATED SAMPLE ANALYZER,
Technicon Instruments Corp., Tarrytown, N.Y. (assignee)
H. G. Diebler, S. A. Gyori, and W. J. C. McCandless.
United States Patent 3,811,842. Issued May 21, 1974. Official Gazette of the United States Patent Office, Vol 922, No 3, p 856-857, May, 1974. 1 fig.

Descriptors: *Patent, *Analyzers, *Sampling, *Temperature control, Fluid movement, Automation, Analytical techniques, Chemistry, Colorimetry, Conduction.
Identifiers: *Fluid manifold, Fluid systems, Blood, Reagents.

A temperature-controlled fluid manifold for a fluid system of an automated sample analyzer was designed for analyzing a series of liquid samples flowing seriatum. The basic elements of the temperature-controlled manifold may be permanently combined with a wide variety of other components to meet the requirements of many different chemistries, each suited for analysis of a different constituent of sample, such as blood. In each individual manifold, the sample may be treated by combination and mixing with any appropriate reagent or reagents under temperature-controlled conditions for subsequent analysis such as a colorimeter. The basic manifold elements comprise a thermally conductive plate or block heated by conduction from a temperature-controlled source of heat. The plate has an outer, exposed surface of substantial area and an appropriate number of appropriately configured fluid passageway portions, such as helical mixing or helical time-delay paths. (Prague-FIRL)
W74-13258

SYSTEM FOR MONITORING AND CONTROLLING SUBSTANCES IN FLUID BODIES,
D. R. Emmons, and W. C. Beverly.
United States Patent 3,809,922. Issued May 7, 1974. Official Gazette of the United States Patent Office, Vol 922, No 1, p 338, May, 1974. 1 fig.

Descriptors: *Patents, *Chlorine, *Monitoring, *Automatic control, Temperature, Concentration, Electronic equipment, Liquids, Measurement, Water treatment.

The addition of substances, such as chlorine, to fluid bodies is controlled and the concentration of such substances is monitored by a special system. A temperature compensated probe measures the concentration, and electronic means responsive to outputs of the probe add the substance, as needed, to the desired level. (Prague-FIRL)
W74-13262

LASER LIGHT SPOTS WATER POLLUTION.
For primary bibliographic entry see Field 5A.
W74-13278

A MULTIPURPOSE SPECTROFLUORIMETER FOR THE STUDY OF NATURAL AND CONTAMINATED WATER, (IN RUSSIAN),
Akademiya Meditsinskikh Nauk SSSR.
For primary bibliographic entry see Field 5A.
W74-13358

AUTOMATIC DEVICES FOR SAMPLING SEWAGE AND SURFACE WATER, (IN RUSSIAN),
Permskii Politekhnicheskii Institut (USSR).
For primary bibliographic entry see Field 5A.
W74-13359

HYGIENIC PROBLEMS OF AUTOMATIC MONITORING OF WATER QUALITY (BASED ON DATA OF THE WHO SEMINAR: KRAKOW: 1971), (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5A.
W74-13363

A DEWPOINT HYGROMETER FOR WATER POTENTIAL MEASUREMENT,
Wescor, Inc., Logan, Utah.
E. C. Campbell, G. S. Campbell, and W. K. Barlow.
Agric Meteorol. Vol 12, No 1, p 113-121, 1973. Illus.

Descriptors: *Moisture meters, *Instrumentation, *Measurement, Dewpoint, Specific head.
Identifiers: Hygrometers.

An improved instrument for determining water potential by measuring dewpoint depression was developed. Theoretical considerations show the instrument to have a sensitivity of 0.75 micro V bar(-1) and a change in sensitivity with temperature of 0.45% C(-1). Without compensation for changes in Peltier cooling, sensitivity, and heat dissipation with temperature, errors of plus or minus 6% result from changing the temperature of the sensor between 20-50C. Performance of the instrument appears to agree well with the theory developed for the technique.--Copyright 1974, Biological Abstracts, Inc.
W74-13407

GROUND WATER LEVEL CONTROL.
German Patent 1,784,335. Issued December 13, 1973. German Patents Abstracts, Vol 6 U, No 51, p 1, January 1974.

Descriptors: Engineering structures, *Pipes, *Pumps, *Groundwater, *Water table, *Patents.

A ground water level control near a pipe trench is described which uses filter pipes and suction pipes introduced before the trench excavation and with connected suction pumps. These pipes are introduced into the ground under the bottom of the graded trench so that the filter pipes lie approximately horizontal behind each other, parallel to the trench line. Each corresponding suction pipe connected to a pump is passed sideways out of the line and projects sideways out of the ground. (Merritt-FIRL)
W74-13446

AN INEXPENSIVE SOLID-STATE AMPLIFIER FOR DETECTING MOVEMENTS AND ELECTRICAL POTENTIALS OF FISH,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5A.
W74-13482

7C. Evaluation, Processing and Publication

DISPOSAL OF HEATED WATER THROUGH GROUNDWATER SYSTEMS, VOLUME II, USER'S MANUAL NUMERICAL SIMULATION OF FLUID FLOW AND HEAT TRANSFER IN GROUNDWATER SYSTEMS,
Kansas Univ., Lawrence. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W74-12754

COMPUTER ANALYSIS OF THE PORE STRUCTURE OF ISOTROPIC POROUS MEDIA,
Agricultural Research Service, Saint Paul, Minn. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 2F.
W74-12815

FIELD INVESTIGATIONS OF HEATED DISCHARGES FROM NUCLEAR POWER PLANTS ON LAKE MICHIGAN: 1972,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W74-12904

A PROCESSING SYSTEM FOR FISCHER AND PORTER PRECIPITATION GAUGE DATA,
Atmospheric Environment Service, Downsview (Ontario).
D. M. Pollock, J. Rogalsky, and D. A. Carr.
Environment Canada Publication No CLI-6-73, 1973. 17 p, 8 fig, 4 tab, append.

Descriptors: *Precipitation gages, *Data processing, *Cost analysis, Climatology, Canada, Precipitation, Computers.
Identifiers: *Fischer and Porter gauges, Ontario.

In 1970, a new system of data processing was introduced which minimized manual intervention without loss of data. In the new system, the tapes are corrected for errors in recording accumulated precipitation (not undercatch of precipitation by the gauge due to wind), and errors in timing. A step by step description of the system from the output tape from the Fischer and Porter Precipitation Gauge, through the tape translator, card punch, and computer was given. The correction logic was given for precipitation amount, time, and for the computer corrections themselves. The means of archiving the output is also given. (Jones-ISWS)
W74-12977

RAINFALL FREQUENCY VALUES FOR KENTUCKY.
Dept. of Natural Resources, Kentucky. Div. of Water.
Engineering Memorandum No 2. April 30, 1971. 37 p, 12 tab.

Descriptors: *Kentucky, *Rainfall intensity, Hydrologic data, Runoff, Rainfall, Rates, Precipitation(Atmospheric), Frequency, Flow rates, Streamflow.
Identifiers: *Rainfall frequency.

Point rainfall values were determined and tabulated for each of the 120 counties in Kentucky. Adjustments for areal and seasonal variations are not presented. Sources of information were Technical Paper 40 (Rainfall Frequency Atlas of the United States for Durations From 30 Minutes to 24 Hours and Return Periods From 1 to 100 Years) and Technical Paper 49 (Two- to Ten-Day Precipitation For Return Periods of 2 to 100 Years in the Contiguous United States), Weather Bureau, U.S. Department of Commerce. Values for runoff volumes and quick return flows are tabulated. The runoff volumes represent regionalized values derived from gaged streamsflow data and supple-

mented with climatological data and local observations. The quick return flows are those rates of discharge expected to persist beyond the flood period as described by the 10 day principal spillway hydrograph. (Humphreys-ISWS)
W74-12979

SPATIAL PATTERNS OF LONG-PERIOD STREAMFLOW FLUCTUATIONS IN THE EUROPEAN USSR,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 2A.
W74-12981

ERRORS OF AERIAL SURVEY OPERATIONS AND OFFICE PROCESSING OF DATA IN AIRCRAFT MEASUREMENTS OF DISCHARGES,
I. G. Shumkov.
Soviet Hydrology, Selected Papers No 2, p 95-111,1973. 7 fig, 1 tab, 6 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No 202, p 39-63, 1973.

Descriptors: *Remote sensing, *Surveys, *Discharge measurement, *On-site data collections, *Correlation analysis, Measurement, Statistical methods, Statistics, Discharge(Water), Streamflow, Hydrologic data, Currents(Water).
Identifiers: *Aerohydrometric survey.

A mathematical analysis of the effect of errors on the determination of discharges by the aerohydrometric method was made. Accuracy of discharge determinations depended significantly on quality of aerial survey and office work, and errors occurring at this stage may reach 10-15% under unfavorable hydrometeorological conditions. Errors could be reduced by a factor of 1.5 - 2. (1) Selection of the site of airdropped range line and assignment of the time of aerial photo surveys with allowance for the position of the center of gravity of the model of estimated discharge made it possible to reduce error in determination of discharge due to the tilt of the aerial photographs; (2) Use of aerial method of determining wind speed and direction considerably improved measurement accuracy when current velocities were low; (3) The minimum number of floats needed must be assigned on the basis of permissible errors, associated with the calibration of floats. (Humphreys-ISWS)
W74-12986

COMPARISONS OF MEASURED AND ESTIMATED DAILY POTENTIAL EVAPOTRANSPIRATION IN A HUMID REGION,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2D.
W74-12988

ONE-DAY EXTREME RAINFALL STATISTICS FOR THE PRAIRIE PROVINCES,
Atmospheric Environment Service, Downsview (Ontario).
For primary bibliographic entry see Field 2B.
W74-13000

QUASI-BIENNIAL STREAMFLOW VARIATION IN THE USSR,
For primary bibliographic entry see Field 2A.
W74-13011

HYDROGEOLOGY OF THE POTTSVILLE FORMATION IN NORTHEASTERN OHIO,
Geological Survey, Washington, D.C.
A. C. Sedam.
For sale by USGS, 1200 S Eads St, Arlington, Va 22202, Price $1.75 per set. Hydrologic Investigations Atlas HA-494, 1973. 2 sheets, 17 ref.

Descriptors: *Hydrogeology, *Maps, *Ohio, *Water resources, *Groundwater, Water wells, Water yield, Hydrologic data, Geologic mapping, Aquifer characteristics.
Identifiers: *Pottsville formation(Ohio).

This 2-sheet hydrologic atlas presents geologic and hydrologic data governing the occurrence of groundwater and its availability from three important sandstone aquifers in northeastern Ohio. These aquifers are the Sharon, the Connoquenessing Sandstone, and the Homewood Sandstone Members of the Pottsville Formation. The Pottsville aquifers, together with the Berea and Cussewago Sandstones, represent the most important bedrock sources of groundwater in northeastern Ohio. Groundwater is an important resource in most parts of northeastern Ohio, and is the chief source of municipal and industrial water supply in Stark, Portage, Geauga, and Wayne Counties. The aquifers of the Pottsville Formation yield more than 60 mgd or about 38 percent of the total groundwater supply in northeastern Ohio. The Sharon Member is the most productive of the three Pottsville aquifers and is the best bedrock source of water in much of northeastern Ohio. (Knapp-USGS)
W74-13015

HYDROLOGY AND WATER RESOURCES OF THE DEERFIELD RIVER BASIN, MASSACHUSETTS,
Geological Survey, Washington, D.C.
F. B. Gay, L. G. Toler, and B. P. Hansen.
For sale by USGS, 1200 S Eads St, Arlington, Va 22202, Price $1.00 per set. Hydrologic Investigations Atlas HA-506, 1974. 2 sheets, 34 ref.

Descriptors: *Water resources, *Massachusetts, *Groundwater, *Surface waters, River basins, Hydrogeology, Hydrologic data, Water quality, Water yield, Reservoirs, Alluvium.
Identifiers: *Deerfield River basin(Mass).

This 2-sheet hydrologic atlas provides information on the quantity, quality, and availability of water to aid in planning, developing, and managing water resources within the Massachusetts part of the Deerfield River basin. From its headwaters in south-central Vermont, the Deerfield River flows southward into Massachusetts, where it joins the Connecticut River at Greenfield. It drains 664 square miles, 348 square miles in Massachusetts. Drainage is in well-defined channels. The natural flow regimen of the Deerfield River has been altered by the operation of Somerset and Harriman Reservoirs in Vermont and by the operation of associated downstream hydroelectric generating stations. In Massachusetts, the river flows through the Berkshire Hills in a narrow valley bordered by steep slopes, rising to more than 1,000 feet above the river; near the Connecticut River the terrain is a flat lacustrine plain bordered by gently rolling hills. Altitudes range from 2,841 feet to 120 feet, with a mean altitude of 1,557 feet. Lakes and ponds are relatively few, only 16 being considered great ponds (more than 10 acres). Most were created or enlarged by earthen dams. The main groundwater reservoirs are in alluvial material adjacent to streams and in the Connecticut Valley lowlands near Greenfield and Deerfield. Bedrock is exposed at higher elevations or is covered with varying thicknesses of till. (Knapp-USGS)
W74-13016

PLANNING METHODOLOGY FOR THE DESIGN OF REGIONAL WASTE WATER TREATMENT SYSTEMS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W74-13018

DRAINAGE SYSTEM DESIGN AND ANALYSIS BY COMPUTER,
Soil Conservation Service, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W74-13021

THE APPLICATION OF STATISTICAL TECHNIQUES TO RIVER QUALITY MANAGEMENT,
EASAMS, Camberley (England).
For primary bibliographic entry see Field 5A.
W74-13024

NONLINEAR LEAST SQUARES TECHNIQUES FOR SYSTEM IDENTIFICATION IN WATER QUALITY,
Columbia Univ., New York. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W74-13028

SEVERITY AND FREQUENCY OF DROUGHT IN MISSISSIPPI,
Mississippi State Univ., State College. Dept. of Agricultural and Biological Engineering.
For primary bibliographic entry see Field 2B.
W74-13052

SPECIAL FLOOD HAZARD INFORMATION REPORT: DRY CREEK, DOUGHERTY COUNTY, GEORGIA.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W74-13067

FLOOD PLAIN INFORMATION: SOPE CREEK, VICINITY OF MARIETTA, GEORGIA.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W74-13068

FLOOD PLAIN INFORMATION, LITTLE NESHAMINY CREEK, BUCKS COUNTY, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W74-13069

SPECIAL FLOOD HAZARD INFORMATION REPORT, CHATTAHOOCHEE RIVER, ROARING BRANCH, WERACOBA CREEK AND LOWER BULL CREEK, VICINITY OF COLUMBUS, GEORGIA.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W74-13070

ARIZONA CLIMATE, 1931-1972.
For primary bibliographic entry see Field 2B.
W74-13139

FORECASTING YIELD OF WHEAT AND BARLEY FROM METEOROLOGICAL FACTORS IN RAIN-FED AREAS OF IRAQ,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 3F.
W74-13154

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT: VOLUME 4. HYDROGRAPH ANALYSIS,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
For primary bibliographic entry see Field 2E.
W74-13177

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Rockville, Md.

For primary bibliographic entry see Field 2H.
W74-13178

FLOODS OF JUNE 1972 IN THE HARRISBURG AREA, PENNSYLVANIA,
Geological Survey, Washington, D.C.
L. V. Page, and L. C. Shaw.
For sale by USGS, 1200 S. Eads St., Arlington, Va 22202, Price $1.00. Hydrologic Investigations Atlas HA-530, 1973. 1 sheet, 3 fig, 1 map, 1 tab, 5 ref.

Descriptors: *Floods, *Pennsylvania, *Maps, Flood data, Flood profiles, Flood frequency, Flood recurrence interval, Stage-discharge relations, Historic floods, Hurricanes.
Identifiers: *Harrisburg(Pa).

This hydrologic atlas presents information on the frequency, depth, and extent of flooding along a 20-mile reach of the Susquehanna River extending from Marysville, Pa., to Falmouth, Pa., and including the Harrisburg area. The approximate area inundated by the flood resulting from tropical storm Agnes in June 1972 is shown on a topographic base map. The purpose is to provide a technical basis from which sound decisions can be made concerning the use of flood-plain lands. The areal extent of flooding is mapped for the largest known flood, which occurred on June 24, 1972, Frequency of flooding on the Susquehanna River was determined from the records of annual peak discharge data for the Nagle Street gaging station at Harrisburg. (Knapp-USGS)
W74-13186

FLOOD OF MARCH 1968 ON THE NEPONSET RIVER, MASSACHUSETTS,
Geological Survey, Washington, D.C.
L. A. Swallow, and G. K. Wood.
For sale by USGS, 1200 S. Eads St. Arlington, Va 22202, Price 75 cents. Hydrologic Investigations Atlas HA-500, 1973. 1 sheet, 4 fig, 1 map, 5 ref.

Descriptors: *Floods, *Maps, *Massachusetts, Flood frequency, Flood recurrence interval, Flood profiles, Flood data, Hydrologic data, Stage-discharge relations.
Identifiers: *Neponset River(Mass), *Boston(Mass).

This 1-sheet hydrologic atlas shows on a photomosaic base the extent of flooding along the Neponset River between Walpole and Milton Lower Mills, Mass., during the flood of March 1968. It also presents flood data for two gaging stations, two crest-stage stations, and a selected downstream site in the Neponset River basin. The report illustrates the magnitude of the March 1968 flood and can guide decisions pertaining to flood-plain use and to flood containment and prevention. The flood of March 1968 on the Neponset River was caused by an intense 3-day storm, which began on March 17. In a 36-hour period, rain, totaling from 5 to 7 inches, fell on ground already saturated by snowmelt and by heavy rain on March 12-13. For the periods of record at the two gaging stations--Neponset River at Norwood and East Branch Neponset River at Canton--maximum discharge of this flood was exceeded only by the flood of August 1955. (Knapp-USGS)
W74-13187

FLOODS IN CAPRON QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
R. S. Grant, and M. D. Duerk.

Descriptors: *Floods, *Illinois, *Maps, Flood data, Flood profiles, Flood frequency, Flood recurrence interval, Flood plains, Hydrologic data.
Identifiers: *Capron(Ill).

This 1-sheet hydrologic atlas presents hydrologic data that can be used to evaluate the extent, depth, and frequency of flooding that affect economic development of flood plains in the Capron quadrangle, northeastern Illinois. It can aid individuals, government agencies, and others responsible for solving existing flood problems and for formulating effective flood-plain regulations that will minimize the creation of new flood problems. The report can also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to the groundwater resources. The areas inundated by floods along streams in the Capron quadrangle are shown on a topographic map. Greater floods than those whose boundaries are shown on the map are possible. The flood boundaries shown provide a record of historic fact that reflects channel conditions existing when the floods occurred. (Knapp-USGS)
W74-13188

FLOODS IN GARDEN PRAIRIE QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
R. T. Mycyk, and R. S. Grant.
For sale by USGS, 1200 S. Eads St., Arlington, Va 22202, Price 75 cents. Hydrologic Investigations Atlas HA-497, 1973. 1 sheet, 10 fig, 1 tab, 2 ref.

Descriptors: *Floods, *Illinois, *Maps, Flood profiles, Flood data, Flood frequency, Flood recurrency interval, Stage-discharge relations, Hydrologic data.
Identifiers: *Garden Prairie(Ill).

This 1-sheet hydrologic atlas presents hydrologic data that can be used to evaluate the extent, depth, and frequency of flooding that affect the economic development of flood plains in the Garden Prairie quadrangle, Northeastern Illinois. It will aid individuals, government agencies, and others responsible for solving existing flood problems and for formulating effective flood-plain regulations that will minimize the creation of new flood problems. The report will also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to the groundwater resources. The areas inundated by floods along streams in the Garden Prairie quadrangle are delineated on a topographic map. Greater floods than those whose boundaries are shown on the map are possible. The flood boundaries shown provide a record of historic fact that reflect channel conditions existing when the floods occurred. (Knapp-USGS)
W74-13189

FLOODS IN HARVARD QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
H. E. Allen, and A. W. Noehre.
For sale by USGS, 1200 S. Eads St., Arlington, Va 22202, Price 75 cents. Hydrologic Investigations Atlas HA-496, 1973. 1 sheet, 11 fig, 3 ref.

Descriptors: *Floods, *Illinois, *Maps, Flood data, Flood frequency, Flood profiles, Flood recurrence interval, Hydrologic data.
Identifiers: *Harvard(Ill).

This 1-sheet hydrologic atlas presents data that can be used to evaluate the extent, depth, and frequency of flooding that affect the economic development of flood plains in the Harvard quadrangle, northeastern Illinois. It will aid individuals, government agencies, and others responsible for solving existing flood problems and for formulating effective flood-plain regulations. The report will also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to the groundwater resources. The areas inundated by floods along streams in the Harvard quadrangle are delineated on a topographic map. (Knapp-USGS)
W74-13190

WATER RESOURCES OF THE MAUMEE RIVER BASIN, NORTHEASTERN INDIANA,
Geological Survey, Washington, D.C.
R. A. Pettijohn, and L. G. Davis.
For sale by USGS, 1200 S. Eads St, Arlington, Va 22202, Price $1.00 per set. Hydrologic Investigations Atlas HA-493, 1973. 3 sheets, 24 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Maps, *Indiana, River basins, Water quality, Water balance, Alluvium, Water supply, Hydrogeology, Streamflow, Hydrologic data.
Identifiers: *Maumee River basin(Ind).

This 3-sheet hydrologic atlas presents general information on streamflow characteristics, groundwater availability, and quality of water in the Indiana part of the Maumee-basin. The emphasis is on the regional rather than the specific approach to the basin's water resources. Therefore, the information should be used for regional planning and not for design purposes. The Maumee River and its tributaries drain 6,608 square miles, of which 1,283 square miles are in northeast Indiana. The St. Joseph River flows south out of Michigan and the St. Marys River northwest out of Ohio. The two rivers join at Fort Wayne, Indiana, to form the Maumee River, which flows northeast through Ohio to Lake Erie. (Knapp-USGS)
W74-13191

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF PARTS OF THE MEDXNEKEAG RIVER AND PRESTILE STREAM BASINS, MAINE,
Geological Survey, Washington, D.C.
G. C. Prescott, Jr.
For Sale by USGS, 1200 S. Eads St, Arlington, Va 22202, Price $1.00. Hydrologic Investigations Atlas HA-486, 1973. 1 sheet, 1 map, 1 tab, 9 ref.

Descriptors: *Water resources, *Maps, *Hydrogeology, *Geologic mapping, *Maine, Water yield, Aquifer characteristics, Water wells, Hydrologic data, Water quality, Groundwater.
Identifiers: *Meduxnekeag River(Maine).

This 1-sheet hydrologic atlas describes briefly the geologic and hydrologic conditions governing the occurrence of groundwater in an area of about 312 square miles in the drainage basins of Meduxnekeag River and Prestile Stream in Aroostook County, northern Maine. The index map shows the area of this report, areas for which reports have been published, and areas where groundwater studies are in progress. The yields that might be expected from properly located and constructed wells of 6 inches or more in diameter in unconsolidated deposits are indicated by the map showing groundwater favorability and surficial geology. This map gives a generalized interpretation of observed geologic and hydrologic data. It provides a logical base for directing detailed exploration for groundwater but does not eliminate the need for such exploration. The yields of 138 wells range from 1 quart per minute to 400 gpm. The average yield is 24 gpm and the median is 8 gpm. The outcrop area for the various formations is shown on the generalized bedrock geologic map. The groundwater in the area is generally of good quality but the water is moderately hard to very hard. (Knapp-USGS)
W74-13192

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE LOWER ST. JOHN RIVER VALLEY, MAINE,
Geological Survey, Washington, D.C.
G. C. Prescott, Jr.

For sale by USGS, 1200 S. Eads St, Arlington, Va 22202, Price 75 cents. Hydrologic Investigations Atlas HA-485, 1973. 1 sheet, 1 map, 1 tab, 10 ref.

Descriptors: *Water resources, *Groundwater, *Maps, *Maine, Geologic mapping, Hydrogeology, Water yield, Aquifer characteristics, Water balance, Water quality, Hydrologic data.
Identifiers: *St. John River(Maine).

This 1-sheet hydrologic atlas describes the geologic and hydrologic conditions governing the occurrence of groundwater in the lower St. John River Valley, Maine. The purpose is to provide information that would be useful to those doing resource planning or to those interested in developing water supplies, particularly supplies large enough for public, industrial, or commercial use, from groundwater sources. The magnitude of yields that might be expected from properly located and constructed wells of 6 inches or more in diameter is indicated by the map showing groundwater favorability areas and surficial geology. The quality of the groundwater in the area is good and the water is generally suitable for most purposes. It is in the moderately hard to hard range, the water in bedrock being somewhat harder and more highly mineralized than water in unconsolidated aquifers. Surface water is softer and less highly mineralized than groundwater. (Knapp-USGS)
W74-13193

FLOOD OF MARCH 1968 ON THE IPSWICH RIVER, MASSACHUSETTS,
Geological Survey, Washington, D.C.
L. A. Swallow, and D. J. Fogarty.
For sale by USGS, 1200 S. Eads St, Arlington, Va 22202, Price $1.00 per set. Hydrologic Investigations Atlas HA-482, 1973. 2 sheets, 5 fig, 4 map, 4 ref.

Descriptors: *Floods, *Maps, *Massachusetts, Flood data, Flood frequency, Flood profiles, Flood recurrence interval, Hydrologic data, Stage-discharge relations.
Identifiers: *Ipswich River(Mass).

This 2-sheet hydrologic atlas presents photomosaics which show areas inundated along the Ipswich River, Massachusetts, during the flood of March 1968, and flood data for the gaging stations in the Ipswich River basin. The report illustrates the magnitude of the March 1968 flood and provides a technical basis for making decisions pertaining to flood-plain use and to flood containment and prevention. The flood of March 1968 on the Ipswich River caused by intense rainfall, which began on March 17. In northeastern Massachusetts, from 4 to 5 inches of rain fell on ground already saturated by snowmelt and heavy rain which had fallen on March 12-13. The resulting flood was the highest for the period of record at the three gaging stations in the Ipswich River basin. At the gaging station near Ipswich, historical data indicate that the flood of March 1968 was the greatest since the flood of 1886. The Ipswich River is a coastal stream which meanders through swamps and meadows along much of its course. Flood damage is caused by inundation rather than by high velocity. Because most of the flood plain along the river is undeveloped, flood damage in March 1968 was not great--confined mostly to the basements of homes. (Knapp-USGS)
W74-13194

FLOOD SURVEYS ALONG TAPS ROUTE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 2E.
W74-13198

GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W74-13209

ESTIMATING SOLAR RADIATION ON MOUNTAIN SLOPES,
Forest Service, (USDA), Franklin, N.C. Southeastern Forest Experiment Station.
For primary bibliographic entry see Field 2D.
W74-13415

A MATHEMATICAL EXAMINATION OF URBAN RUN-OFF PREDICTION,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 4C.
W74-13449

8. ENGINEERING WORKS

8A. Structures

RED BOILING SPRINGS WATERSHED PROJECT, MACON AND CLAY COUNTIES, TENNESSEE, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-13223

ALPINE LAKE PROJECT ALPINE, TEXAS, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W74-13224

TREXLER LAKE, JORDAN CREEK, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W74-13225

SOME INVESTIGATIONS CONCERNING UPVC WATER AND SEWER PIPES AND FITTINGS,
Vattenbyggnadsbyran Ltd., Stockholm (Sweden).
L.-E. Janson, and P. Valimaa.
Journal of the American Water Works Association, Vol 66, No 6, p 360-368, June, 1974. 18 fig, 10 ref.

Descriptors: *Pipes, Construction materials, Pressure conduits, *Sewers, *Testing, Performance.
Identifiers: Fittings, *Finland, *UPVC pipes.

Developmental work conducted in Finland on long-term behavior of pipes and fittings as a function of raw material properties and manufacturing techniques is discussed. Results show that the raw material properties for UPVC pipes are far more important for the long-term strength than has been recognized in most international standards. As for pressure pipes, the permissible tensile stress can easily be raised if proper requirements of the raw material are formulated and an adequate testing method is introduced. Even for sewer pipes the raw-material properties are of great importance for the long-term behavior of the total installation. (Sandoski-FIRL)
W74-13313

UNIVERSAL BASIN FOR USE IN A SEWER SYSTEM,
J. M. Johannessen.
United States Patent 3,815,748. Issued June 11, 1974. Official Gazette of the United States Patent Office, Vol 923, No 2, p 549, June 11, 1974. 1 fig.

Descriptors: *Patents, Equipment, *Sewers, *Basins, Flow.
Identifiers: *Sewer systems.

A patent was issued for a basin to be used in a sewer system. The equipment has a draining device designed as a cover and consists of a housing with a submerged inlet opening and a centrally located outlet opening. The housing contains an outlet chamber with a circular or helical sidewall. An inlet tube opens tangentially along this sidewall into the outlet chamber. When the water level in the basin rises, the water flowing into the outlet chamber circulates so that it works as a centrifugal brake and retards the water flow. (Prague-FIRL)
W74-13335

TARGET SYSTEM FOR LAYING SEWER PIPES,
Laser Alignment, Inc., Grand Rapids, Mich. (assignee).
R. J. Roodvoets, and J. Stapert, Jr.
United States Patent 3,815,250. Issued June 11, 1974. Official Gazette of the United States Patent Office, Vol 923, No 2, p 419, June 11, 1974. 1 fig.

Descriptors: *Patents, *Sewers, Pipes, Installation, Equipment.
Identifiers: *Sewer pipes, *Lasers.

An adjustable target is described which has use in aligning pipes with a laser beam or an other similar collimated light beam which is projected axially with the pipe. The target has a base member, a level carried by the base member, and an upright target carried by an vertically adjusted relative to the base. Extension means for the base member extend the base laterally to permit the target to be employed in larger pipes. (Prague-FIRL)
W74-13337

EXPERIENCES WITH BUTTERFLY VALVES,
Kansas City, Mo. Div. of Water Supply.
J. R. Popalisky.
Journal of the American Water Works Association, Vol 66, No 6, p 349-351, June, 1974. 4 fig, 1 tab.

Descriptors: *Butterfly valves, *Water treatment, Equipment, Water supply, *Missouri.
Identifiers: *Raw-water pump discharge-and-distributions-control system.

The use of rubber-seated butterfly valves is elucidated. The valves are employed in low-pressure applications at a water treatment facility in Kansas City, Missouri. Experience with these valves has been generally favorable except for 30 in a group of 32 associated with a raw-water pump discharge-and-distributions-control system for a treatment facility. The valves had gum-rubber seats and stainless-steel disc edges. The isolated seat failures were attributed to the substitution of inferior rubber compounding material and the use of the seats in a non-disinfected raw-water environment. (Leibowitz-FIRL)
W74-13338

COMPUTERIZED REPORTS IMPROVE SEWER MAINTENANCE,
For primary bibliographic entry see Field 5G.
W74-13339

DOUBLE-BOTTOM BARGES PROVIDE GREATER PROTECTION AGAINST WATER POLLUTION.
For primary bibliographic entry see Field 5G.
W74-13437

GIGANTIC PIPE RESCUES A TOWN FROM FLOODING.
Excavating Contractor, Vol 68, No 4, p 20-21, April, 1974.

Descriptors: *Floodproofing, *Concrete pipes, Floodplains, Pipes, Rural areas, Storm drains, Storm runoff, Cities, Costs, Control structures, Drainage engineering, *Michigan.

Identifiers: *Land runoff, *Henry-Graham Storm Drain, Pre-cast concrete, Detroit(Mich).

As rural areas are developed and land runoff becomes a problem, large diameter pipes may provide a viable solution. In the suburbs of Detroit, a former flood plain which is now residential was previously perennially flooded. To relieve this problem, the Henry-Graham Storm Drain was constructed. This is a mile-long segment of steel-reinforced pre-cast concrete pipe, 17 feet in diameter. Its design outlet capacity is 2000 cu ft per second. This pipe successfully carries incredible water capacities and allows the entire system to be effective, preventing flooding. (Prague-FIRL)
W74-13447

8B. Hydraulics

FUNDAMENTALS OF TRANSPORT PHENOMENA IN POROUS MEDIA.
International Association for Hydraulic Research, Delft (Netherlands); and International Society of Soil Science, Amsterdam (Netherlands).
For primary bibliographic entry see Field 2F.
W74-12811

PORE STRUCTURE AND FLOW PROPERTIES OF POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
For primary bibliographic entry see Field 2F.
W74-12814

JUMP CONDITIONS IN THE HYDRODYNAMICS OF POROUS MEDIA,
Agricultural Research Service, Madison, Wis. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 2F.
W74-12821

FLOW OF WATER THROUGH POROUS MEDIA AT LOW SHEAR RATES,
New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-12830

APPLICATION OF BOUNDARY-LAYER THEORY TO DISPERSION IN WELL-MIXED ESTUARIES,
Nielsen Engineering and Research, Inc., Mountain View, Calif.
For primary bibliographic entry see Field 5B.
W74-12858

BUOYANT FORCED-PLUMES IN CROSS FLOW,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
V. H. Chu, and M. B. Goldberg.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY9, Proceedings Paper 10805, p 1203-1214, September 1974. 5 fig, 10 ref, 2 append. National Research Council of Canada Grant A7922.

Descriptors: *Entrainment, *Jets, *Mixing, *Buoyancy, Laboratory tests, Density, Turbulence, Momentum equation, Viscosity, Vortices.
Identifiers: Near field, Far field, *Cross flow.

Buoyant forced-plumes in a neutrally stable cross flow were simulated in a laboratory flume. Saline solution was injected into the stream of freshwater to study the combined effects of exit-momentum flux and buoyancy. A simple theory based on dimensional argument and on the entrainment concept is proposed. The entrainment coefficient remains essentially constant (approx. 0.5) along the plume, independent of local density differences. An equation was developed to determine the downstream location of the transition from near field flow which depends on jet exit momentum flux to far field flow which depends primarily on buoyancy. (Adams-ISWS)
W74-12978

STORM SURGES IN THE BAY OF BENGAL,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2L.
W74-12985

SWIRLING SHALLOW SUBMERGED TURBULENT PLUMES,
Colorado Univ., Boulder. Dept. of Aerospace Engineering Science.
For primary bibliographic entry see Field 5B.
W74-12989

SURFACE SHEAR WAVES,
Bristol Univ. (England). School of Mathematics.
D. H. Peregrine.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY9, Proceedings Paper 10809, p 1215-1227, September 1974. 7 fig, 15 ref, 3 append. Army Contract DA-31-124-ARO-D-462.

Descriptors: *Beaches, *Hydraulics, *Waves(Water), *Mathematical models, *Sluices, *Mathematics, Hydraulic jump, Rotational flow, Weirs, Viscous flow, Streams, Sands, Dunes.
Identifiers: *Fluid flow, *Backwash from surf, *Surface shear waves, Wave hydraulic jump, Antidunes, Turbulent jet.

Two examples of steep very large amplitude waves were described. One occurs on flows below weirs or sluices and is known as the wave hydraulic jump. A mathematical analysis was presented to describe its main features. This mathematical model also partially explains the first approximation of the flow of a supercritical stream which is forced by an obstacle to separate from its bed and flow over an eddy. The other example is a stationary form of surface wave, that can be observed in backwash from surf on a beach. It was suggested that these waves are formed by flow over a separation eddy. This hypothesis which was proposed as valid for these latter waves served to link them with the wave hydraulic jump. The general name 'surface shear waves' was proposed for both wave types since their steep rounded crests could be explained by a thin fast surface layer of water. (Bhowmik-ISWS)
W74-12994

THE DEVELOPMENT FROM TWO-DIMENSIONAL TO THREE-DIMENSIONAL TURBULENCE GENERATED BY BREAKING WAVES,
State Univ. of New York, Albany. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 2H.
W74-12996

SOME EXPERIMENTAL OBSERVATIONS OF UPSTREAM DISTURBANCES IN A TWO-FLUID SYSTEM,
Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Materials Science; and Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
R. R. Long.
Tellus, Vol 26, No 3, p 313-317, 1974. 4 fig, 5 ref. Contract N00014-67-A-0163-0013.

Descriptors: *Stratified flow, *Channel flow, *Hydraulic jump, *Atmosphere, Energy loss, Theoretical analysis, Upstream, Flow, Channels, Waves(Water).
Identifiers: *Experimental observations, *Obstacle crest, *Fluid flow, Hydraulic drop.

Some experimental measurements of flow of two fluids over an obstacle in a channel were reported. Comparisons were made between theoretical predictions of upstream disturbances and measurements of the height and speed of the upstream jump and the depth of the lower fluid over the obstacle crest. The results indicated good quantitative agreement between theory and observations when the lower fluid has a depth less than that of the upper fluid. However, when the lower fluid was deeper than the upper fluid, the predicted upstream disturbance did not occur. (Bhowmik-ISWS)
W74-13003

STANDING WAVES ON BEACHES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W74-13006

DETERMINISM AND STOCHASTICITY IN HYDROLOGY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-13010

DRAINAGE SYSTEM DESIGN AND ANALYSIS BY COMPUTER,
Soil Conservation Service, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W74-13021

OPTIMIZED DESIGN OF A SUBSURFACE DRAINAGE SYSTEM,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W74-13025

UNIT STREAM POWER FOR SEDIMENT TRANSPORT IN NATURAL WATERS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2J.
W74-13049

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT: VOLUME 4. HYDROGRAPH ANALYSIS,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
For primary bibliographic entry see Field 2E.
W74-13177

DESIGN, DRILLING AND COMPLETION, OPERATION, AND COST OF UNDERGROUND WASTE DISPOSAL WELLS IN GULF COAST REGION OF TEXAS AND LOUISIANA,
Pollution Control and Waste Disposal, Inc., New Orleans, La.
For primary bibliographic entry see Field 5B.
W74-13340

A CONTINUUM MECHANICAL APPROACH TO THE FLOW EQUATIONS FOR MEMBRANE TRANSPORT: I. WATER FLOW,
Meharry Medical Coll., Nashville, Tenn. Div. of Biophysics and Neurobiology.
For primary bibliographic entry see Field 2E.
W74-13367

8C. Hydraulic Machinery

FUEL SEDIMENT BOWL ASSEMBLY,
Deere and Co., Moline, Ill. (assignee)
For primary bibliographic entry see Field 5D.
W74-13245

GROUND WATER FOR THE OIL INDUSTRY IN TEXAS AND SOUTHEAST NEW MEXICO,
For primary bibliographic entry see Field 4B.
W74-13343

SEWAGE AERATOR - WITH SUBMERGED MOTOR CARRIED BY FLOATS.
For primary bibliographic entry see Field 5D.
W74-13443

8D. Soil Mechanics

THE SEALING MECHANISM OF WASTE-WATER PONDS,
California Univ., Riverside. Dept. of Soil Science and Agriculture.
For primary bibliographic entry see Field 5D.
W74-13299

8E. Rock Mechanics and Geology

ROCK MECHANICS PROPERTIES OF TYPICAL FOUNDATION ROCK TYPES: SUMMARIZING PHYSICAL AND MECHANICAL TESTS OF ROCK SAMPLES FROM SEVERAL TYPES OF FOUNDATION SITES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
J. R. Brandon.
Report REC-ERC-74-74-10, July 1974. 99 p, 3 fig, 3 tab.

Descriptors: *Rock properties, *Foundation rocks, *Rock mechanics, *Data collections, Elasticity(Mechanical), Dams, Mechanical properties, Physical properties, Shear strength, Strength.

Tests of physical and mechanical properties of representative rock core samples from several U.S. Bureau of Reclamation project foundation sites are summarized in rock data sheets. The summary includes location, geologic occurrence, and a petrographic description of the rock types. Properties listed include: absorption; specific gravity; secant elastic modulus; compressive strength; tensile strength; and shear strength, including cohesion and coefficient of angle of internal friction. The work covers 43 typical rock types from sites of dams, powerplants, tunnels, and other Bureau structures. (Knapp-USGS)
W74-13211

GROUND WATER FOR THE OIL INDUSTRY IN TEXAS AND SOUTHEAST NEW MEXICO,
For primary bibliographic entry see Field 4B.
W74-13343

8G. Materials

ICEBREAKING BY TOW ON THE MISSISSIPPI RIVER,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-13170

8H. Rapid Excavation

KRA CANAL PROJECT: A PRELIMINARY ASSESSMENT OF NUCLEAR EXCAVATION FEASIBILITY FOR ROUTE 5A,
California Univ., Livermore. Lawrence Livermore Lab.
J. Toman, H. Tewes, K. Peterson, D. Emerson, and D. Montan.
Available from NTIS, Springfield, Va. 22161 as UCRL-51418; $3.25/copy, $2.25/microfiche. Report No UCRL-51418, June 1974. 22 p, 11 fig, 7 tab.

Descriptors: *Nuclear explosions, Nuclear engineering, Construction, Craters, *Canals, *Channels, *Surveys, Environmental effects, *Feasibility studies, Economics, Cost-benefit analysis, Assessment, Safety, Evaluation, Comparative benefits, Comparative costs.
Identifiers: *Thailand(Isthmus of Kra).

A preliminary survey of the possibility of excavating a portion of a canal across the Isthmus of Kra with nuclear explosives has been completed. For the proposed route (designated 5A), a conservative approach has been used to determine 'upper limit' values for potential adverse effects resulting from the nuclear and conventional construction phases of the project. This survey does not claim to be a detailed design, nor, indeed, a feasibility study. Emphasis has been on evaluating those issues which might rule out the possibility of nuclear excavation at this stage, and on providing a basis for comparing the safety, operational, and economic factors of the nuclear option with those of conventional excavation. Within the limitations of the study, it has been concluded that there are no technical, safety, or operational factors which would preclude the successful implementation of this project. (Houser-ORNL)
W74-13119

A SELECTED, ANNOTATED BIBLIOGRAPHY OF THE CIVIL, INDUSTRIAL, AND SCIENTIFIC USES FOR NUCLEAR EXPLOSIONS.
Technical Information Center (AEC), Oak Ridge, Tenn.
For primary bibliographic entry see Field 5C.
W74-13133

8I. Fisheries Engineering

FISH POISONING IN THE EASTERN CARIBBEAN,
Caribbean Research Inst., St. Thomas, Virgin Islands.
For primary bibliographic entry see Field 5C.
W74-12772

THE DESIGN OF AN AQUACULTURE ENTERPRISE,
Foods MultiNational, Inc., Groton, Mass.
H. H. Webber.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 117-125.

Descriptors: *Design criteria, *Aquiculture, *Sites, Desicion making, Economic evaluation, Fish management, Social aspects, Institutional constraints, Legal aspects, Political aspects, Fish farming, Limiting factors, Heated water.
Identifiers: Range fish management, Static pond aquafarming, Raceway fish culture, Cage fish culture, Basket fish culture.

Factors to be considered in choosing the optimum aquaculture management approach are discussed. Under a ranch management approach, Natural embayments are treated like the open ranges of the early west. Choice of this approach depends on the embayment's ecological suitability as well as its legal and social availability. This approach tends to be labor intensive and shares the high costs of any 'cattle round-up.' A second approach, the static pond method, requires adequate knowledge about the soil and water supply conditions because of the tremendous amount of earthwork and water required for such ponds. Rations must be provided to ensure an optimal yield. A closed high density culture approach employing a closed water recycling mechanism is also explored; under this approach the firm is less sensitive to outside pollutants although it requires sizable capital investment. Two other approaches: a race culture method utilizing flowing water and a cage approach which confines animals suspended in large water bodies or raceways are explored. In raceways complete ration must be provided. A checklist of aquaculture site selection criteria covering ecological, economic, political, legal, and social parameters is also presented. (Schroeder-Wisconsin)
W74-12773

THE LOBSTER FISHING INDUSTRY OF MT. PLEASANT, BEQUIA ISLAND, WEST INDIES,
Minnesota Univ., Duluth. Dept. of Geography.
For primary bibliographic entry see Field 6C.
W74-12774

CONSTRUCTION AND REHABILITATION OF COMMERCIAL OYSTER REEFS IN FLORIDA FROM 1949 THROUGH 1971 WITH EMPHASIS ON ECONOMIC IMPACT IN FRANKLIN COUNTY,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
W. K. Whitfield, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-73-11280, $3.75 in paper copy, $2.25 in microfiche. Special Scientific Report No 38, April 1973. 42 p, 36 fig, 6 tab, 22 ref.

Descriptors: *Marine fisheries, *Oysters, *Economic impact, Commercial fisheries, Management, Florida, Cost analysis.

In 1949, the Florida Department of Natural Resources began rehabilitating depleted natural oyster bars and constructing new beds. Since then, over 4.2 million bushels of oyster shells and other cultch material have been planted in 10 Florida counties including 1.9 million bushels planted in three counties during 1967-71. Recently planted reefs comprise 12% of local reef acreage used by oystermen. Areas selected for reef construction and rehabilitation were chosen according to water quality, hydrography, physiography and biological considerations. Cultch was planted by blowing shells off both sides of a stationary barge utilizing a high pressure water stream. Oyster beds planted in Florida may be harvested around the edges 18 months after construction and will reach full commercial productivity in 24-30 months. Planting costs were approximately 9.5 cents/bushel of cultch material. Unamortized planting expenditures are estimated to be less than 1% of the estimated value of the oysters expected to be harvested from the planted reefs over a 20 year period. The economic impact of the oyster harvest on Bay, Brevard and Franklin Counties is described. (Schroeder-Wisconsin)
W74-12776

THE SIGNIFICANCE OF SUMP-PONDS IN HARVESTING PADDY-FIELD FISHES IN NORTH KRIAN, PERAK.
Universiti Sains Malaysia. Penang. Pusat Pengajian Sains Kajihayat.
Tan Soon Peng.
Malay Nat J. 26(1/2): 26-31. Illus. 1973. (In Engl.).

Descriptors: Fish, Sumps, Endrin, Pesticides, *Fish management, Fisheries, Fish farming.
Identifiers: Anabas-testudineus, BHC, Clarias-macrocephalus, Krian, Malaysia, Ophiocephalus-striatus, Paddy, Thiodan, Trichogaster-pectoralis.

In Northern Krian, Perak, Malaysia, the 4 main species of fish found in the paddy fields are Trichogaster pectoralis, Clarias macrocephalus, Ophiocephalus striatus and Anabas testudineus. The 'telaga' of sump-pond constructed adjacent to paddy fields yields a crop worth approximately 1/4 of the annual income from paddy cultivation. This

good fisheries potential needs encouragement. The size of the fish catch will be dependent upon the area, the abundance of aquatic plants and the use of insecticides. The use of Thiodan, BHC and Endrin caused destruction of the fish population.--Copyright 1974, Biological Abstracts, Inc.
W74-13039

THE EFFECT OF SUPPLEMENTARY ALGAL FEEDING OF A HATCHERY BREEDING STOCK OF OSTREA EDULIS L. ON LARVAL VIGOUR.
Ministry of Agriculture, Fisheries and Food, Conway (Wales). Fisheries Experiment Station.
M. M. Helm, D. L. Holland, and R. R. Stephenson.
J Mar Biol Assoc UK. 53(3): 673-684, Illus, 1973. (In Engl. with Engl. summ.).

Descriptors: Fish management, *Fish hatcheries, Algae, *Oysters, Commercial shellfish, Shellfish, Breeding.
Identifiers: Algal, Breeding, Condition, Decline, Dry, Factor, Feeding, Growth, Hatchery, Larval, Meat, Ostrea-edulis, Phyto, Plankton, Rate, Stock, Tetraselmis-suecica, Viability, Vigor, Weight.

Adult European flat oysters, Ostrea edulis, receiving a food supplement of the unicellular alga Tetraselmis suecica during laboratory conditioning for spawning produced more broods of larvae than oysters receiving only the natural phytoplankton in the seawater supply. Many of the broods from adults receiving this extra food were liberated sooner and these larvae grew at an enchanced rate and provided greater spat yields than the broods from the control stock. The viability of larvae, which significantly correlated with their lipid (in particular neutral lipid) proportion at the time of liberation, declined as the length of the stock-conditioning period prior to female spawnings increased. This may be related to the decline in the dry meat weight and the condition factor of the adult oysters during the experiments irrespective of the feeding regime. The extra algal ration provided a check to the decline in dry meat weight of the food-supplemented adults.--Copyright 1974, Biological Abstracts, Inc.
W74-13042

STUDIES ON BIOLOGY OF MASTACEMBELUS PANCALUS (SPINY EEL, HAMILTON) IN ARTIFICIAL PONDS: I. NATURAL HABITAT, DISTRIBUTION, FOOD AND FEEDING HABITS, AND ECONOMIC IMPORTANCE,
Bangladesh Agricultural Univ., Mymensingh. Dept. of Agricultural Management.
For primary bibliographic entry see Field 2H.
W74-13387

NEW CASES OF MASSIVE DEVELOPMENT OF PRYMNESIUM PARVUM CART, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kherson (USSR).
For primary bibliographic entry see Field 5C.
W74-13391

RATE OF SULFATE REDUCTION IN MUD DEPOSITS OF PONDS OF THE 'KARAMETNIYAZ' FISH FARM, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W74-13392

POPULATION DYNAMICS OF HATCHERY-REARED LANDLOCKED SALMON, SALMO SALAR, AT SCHOODIC LAKE, MAINE,
Maine Dept. of Inland Fisheries and Game, Augusta.
For primary bibliographic entry see Field 2H.
W74-13488

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

SOUTH CAROLINA'S NEW MARINE RESOURCES CENTER,
South Carolina Wildlife Resources Dept., Charleston. Marine Research Lab.
For primary bibliographic entry see Field 2L.
W74-12775

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

WASTEWATER TREATMENT: PHYSICAL AND CHEMICAL METHODS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-12934

WASTEWATER TREATMENT: ACTIVATED SLUDGE,
McKee (Arthur G.) and Co., San Mateo, Calif.
For primary bibliographic entry see Field 5D.
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WASTEWATER TREATMENT: LAGOONS AND OXIDATION PONDS,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 5D.
W74-12936

WASTEWATER TREATMENT: ANAEROBIC PROCESSES,
Institute of Gas Technology, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-12937

WASTEWATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-12938

WASTEWATER TREATMENT: WATER RECLAMATION AND REUSE,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W74-12939

WASTEWATER TREATMENT: LAND DISPOSAL OF WASTEWATER,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5D.
W74-12940

INDUSTRIAL WASTES: PAPER AND APPLIED PRODUCTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-12941

A SELECTED, ANNOTATED BIBLIOGRAPHY OF THE CIVIL, INDUSTRIAL, AND SCIENTIFIC USES FOR NUCLEAR EXPLOSIONS.
Technical Information Center (AEC), Oak Ridge, Tenn.
For primary bibliographic entry see Field 5C.
W74-13133

JOJOBA: A WAX-PRODUCING SHRUB OF THE SONORAN DESERT, LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 2I.
W74-13141

10C. Secondary Publication And Distribution

A SELECTED ANNOTATED BIBLIOGRAPHY ON LAND RESOURCE INVENTORY AND ANALYSIS FOR PLANNING,
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
For primary bibliographic entry see Field 6A.
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10D. Specialized Information Center Services

TOXIC MATERIALS INFORMATION CENTER ENVIRONMENTAL INFORMATION SYSTEMS OFFICE,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
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10F. Preparation Of Reviews

WASTEWATER TREATMENT: PHYSICAL AND CHEMICAL METHODS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-12934

WASTEWATER TREATMENT: ACTIVATED SLUDGE,
McKee (Arthur G.) and Co., San Mateo, Calif.
For primary bibliographic entry see Field 5D.
W74-12935

WASTEWATER TREATMENT: LAGOONS AND OXIDATION PONDS,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 05D.
W74-12936

WASTEWATER TREATMENT: ANAEROBIC PROCESSES,
Institute of Gas Technology, Chicago, Ill.
For primary bibliographic entry see Field 05D.
W74-12937

WASTEWATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W74-12938

WASTEWATER TREATMENT: WATER RECLAMATION AND REUSE,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05D.
W74-12939

WASTEWATER TREATMENT: LAND DISPOSAL OF WASTEWATER,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 05D.
W74-12940

INDUSTRIAL WASTES: PAPER AND APPLIED PRODUCTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 05D.
W74-12941

PROBLEMS WITH DUMPING OF RED MUD IN SHALLOW WATERS. A CRITICAL REVIEW OF SELECTED LITERATURE,
Bundesforschung sanstalt fuer Fischerei, Hamburg (West Germany). Institut fuer Kuesten- und Binnenfischerei Isotopenlaboratorium.
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

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